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WATER RESOURCES INSTITUTE
LEXINGTON, KENTUCKY

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 1, NUMBER 2
FEBRUARY 1968

Selected Water Resources Abstracts includes abstracts of current monographs, journal articles, translations, and reports. The contents of these documents cover the physical, life, and social science, as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water.

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SELECTED
WATER RESOURCES ABSTRACTS

VOLUME 1, NUMBER 2
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UNITED STATES DEPARTMENT OF THE INTERIOR
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

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WATER RESOURCES

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R202489X67A WRITING LIKE A PRO

Writing reports, papers, proposals, and manuals can be easier and less distasteful to engineers if they adopt the methods of professional writers. The engineer should think of the writing task as an engineering project, estimating and scheduling the time required for completion; by working on schedule, he will have time for the subconscious to work with the conscious mind as a creative tool. He must coordinate writing with his peak energy period and seek quiet and thought-producing surroundings. The professional uses these methods to get started. Later, if difficulties continue to persist, the following requirements should be reviewed: (1) know the reader and his interests and direct the writing to him, (2) be sure the main subject is not overshadowed by a dozen different and competing topics, and (3) acquire enough background information to support the main subject. The engineer should convey enthusiasm for and knowledge of his subject to the reader. Mechanical writing skills such as spelling, grammar, and punctuation can be left to the typist or editor. Experimenting to find the best method and time for working will produce the precise and efficient tools necessary for communicating effectively.

R202489X67A

Clarke, Emerson
WRITE IT LIKE A PRO
Machine Design, Vol 39, No 20, pp 90-92, Aug 31, 1967. Zenith Radio Corp, Chicago, Ill, 3 p, 2 fig
DESCRIPTORS-- *technical writing/ engineering personnel/ management/ time/ *methodology/ planning/ preparation/ *scheduling/ applied psychology/ work/ concentration/ efficiencies/ creativity/ environment/ orientation/ editing/ communications/ training/ professional personnel
IDENTIFIERS-- ideas/ problem solving/ clarity

R202490X67A SYSTEMS ANALYSIS--AN ORDERLY APPROACH

Business systems analysis is an orderly study of the detailed procedures for collecting, organizing, and evaluating information within an organization, with the objective of improving control over its operations or reducing the cost of exercising this control. Environmental problems such as people, space, business objectives, available data, state of documentation, prejudices, and inbred concepts make analysis extremely difficult for the systems analyst to relate one case to another and directly apply past experience to the particular project at hand. An attempt to allay some of the misconceptions about systems analysis and propose a phased program for orderly and controllable systems review which can be ended, expanded, or contracted at will are discussed. The phased program for systems analysis consists of 3 segments: (1) current systems review--the determination of whether the current system satisfactorily performs the functions expected of it; (2) feasibility study--the study in which a projection is made of how a proposed system might operate in a particular organization to provide the basis for a decision to replace or not replace the existing system; and (3) applications study--the detailed process of designing a system or set of procedures for using data processing equipment for a selected function.

R202490X67A

Mason, John J
BUSINESS SYSTEMS ANALYSIS--AN ORDERLY APPROACH
Computers & Automation, Vol 16, No 8, pp 26-31, Aug 1967. Holland Assoc, Inc, Washington, D C, 6 p, 1 fig
DESCRIPTORS-- *systems analysis/ *methodology/ data processing systems/ management/ project planning/ feasibility studies/ computers/ automation/ capital costs/ scheduling/ coordination/ control/ standards/ documentation/ decision making/ economics/ operations research/ professional personnel/ operations
IDENTIFIERS-- *systems engineering/ procedures/ *management planning/ information systems

R202514X67A BIG NEW PUSH TO EDUCATE

In-service educational technology has developed at such a rapid rate and over such a broad spectrum that business and academic communities have not grasped the significance of this very real revolution. This expansion helps the administrator meet the challenge of the shortage of competent people in all types of organizations. He must exert a generalist-manager's knowledge of training, trainers, and learning tools; keep abreast of new devices and furnishings for self-learning systems and in-office classrooms, such as computer-driven blackboards and closed circuit TV tapes; keep in contact with educational specialists under his supervision and from outside educational institutions or corporations; relate his organization's needs for personnel training, retraining, and development to benefits and costs; and participate in new management development courses. Company devised and oriented training courses and corporation-developed training systems, such as VESI and TUTOR, are described. Various types of generalized programmed instructions or vast systems of computer-aided instruction are packaged commercially or customized for individual companies.

R202514X67A

Kleinschrod, Walter A
THE BIG NEW PUSH TO EDUCATE
Admin Mgt, Vol 28, No 8, pp 16-22, Aug 1967. 6 p, 2 photo
DESCRIPTORS-- *education/ *training/ efficiencies/ personnel/ programs/ technology/ responsibilities/ personnel management/ management/ computer programming/ administration/ communications/ costs/ concentration
IDENTIFIERS-- self-improvement/ management planning/ self-learning systems/ programmed instruction/ visual aids/ continuing education/ communication tools

R202520X67A MULTIPLYING YOUR EFFECTIVENESS

Some people accomplish more than others because they work more effectively. To achieve this effectiveness they: (1) know what they want to do and have a clear understanding of the end results and the time required to accomplish these results, (2) are sure their plans are compatible with those of their employers, and (3) inventory their ability to do the job confronting them. Ten characteristics common to people who work and act effectively are drive, responsibility, analytical ability, creative capacity, foresight, communicative skill, technical proficiency, resourcefulness, judgment, and sociability. Each characteristic is reviewed and advice given on how to obtain maximum results from a minimum expenditure of time and energy.

R202520X67A

Marvin, Philip
MULTIPLYING YOUR EFFECTIVENESS: A GUIDE TO COUNSELING YOUNG EXECUTIVES
Personnel Admin, Vol 30, No 5, pp 51-55, Sept-Oct 1967. U of Cincinnati, Ohio, 5 p
DESCRIPTORS-- management/ administration/ *motivation/ responsibilities/ analysis/ *creativity/ reasoning/ communications/ reliability/ flexibility/ efficiencies/ characteristics/ *leadership/ decision making/ training/ human engineering
IDENTIFIERS-- *goals/ performance/ *evaluation/ productivity/ professional advancement/ *professional development/ problem solving/ ability/ *ideas

R202521X67A PATHWAY TO PROFIT--AN INFORMATION SYSTEM

To a significant extent, the future profit picture of any business enterprise is the result of gathering concise, complete, accurate, and timely information and analyzing it intelligently for use in planning and decision-making processes. A management information system is a dynamic and organized method of developing the information needs of each manager within the organization and disseminating the data in such a way as to aid his understanding and stimulate action. The types of information needed by managers can be grouped into 3 major categories: (1) information for operation and control, (2) information to assess future action, and (3) information to assess or compare performance of the enterprise with competition within the industry. No system, data processing installation, or plant modernization alone can improve profits. To be effective, each function must operate within the framework of good management, which is always dependent on good information.

R202521X67A

Colbert, Bertram A
PATHWAY TO PROFIT: THE MANAGEMENT INFORMATION SYSTEM
Mgt Services, Vol 4, No 5, pp 15-24, Sept-Oct 1967. Price Waterhouse & Co, Chicago, Ill, 10 p, 28 fig
DESCRIPTORS-- *decision making/ *planning/ management/ administration/ data processing systems/ systems analysis/ methodology/ control/ computers/ data collection systems/ automation/ coordination/ requirements/ simulation/ charts/ graphical analysis/ operations/ records/ auditing
IDENTIFIERS-- *profits/ *information systems/ *management planning/ goals/ reports/ data elements

R202527X67A WAY TO BETTER SUPERVISION

Since the turn of the century, managers have been trying to find a scientific way to motivate employees to increased production. The author traces the historical sequence of steps taken to improve management, points out significant research findings, and discusses conditions necessary to optimize efficiency and effectiveness. Recent research has shown that: (1) motivation is important, (2) people act as they do in response to their own needs, (3) different viewpoints cause people to respond differently, (4) modern industrial society has more complex and psychologically oriented needs, and (5) people are best motivated by satisfying their needs through work. Managers can be more effective if they discuss with subordinates what goals are important and how to achieve them. Using theoretical considerations and practical experience, conclusions are that 2-way influence is more productive than 1-way influence and that systematic management is practicable.

R202527X67A

Wallace, Emmett and Shaw, Malcolm
REFINING THE ROUTE TO BETTER SUPERVISION
Chem Engg, Vol 74, No 19, pp 210-216, Sept 11, 1967. Educational Systems & Designs, Inc, Westport, Conn, 5 p, 4 ref
DESCRIPTORS-- *supervision/ management/ planning/ control/ *efficiencies/ organizations/ *motivation/ decision making/ human behavior/ analysis/ methodology/ standards/ compensation// behavior /psychology// engineering personnel/ employee relations/ *personnel management/ environment
IDENTIFIERS-- performance/ professional advancement/ problem solving/ working conditions/ productivity

ADMINISTRATION AND MANAGEMENT

R202553X67A MANAGEMENT SCIENCE & INFORMATION SYSTEMS

The principal purpose of a management information system is to provide economically the information needed for planning, directing, evaluating, coordinating, and controlling the firm. The author relates earlier developments in management thought to modern organization views; discusses aspects of decision making, the systems concept, and man-machine systems; identifies the overall goals that an integrated information system should serve; suggests an approach to be followed by information system planners; and attempts to foresee how a widespread use of information systems may affect organization structure and management practice. Use of information systems will: (1) allow management more time for planning, since less time will be required for search and analysis of information; (2) enable management to evaluate the probable effect of different courses of action, assess the corresponding profit potentials, and anticipate the measures required to meet environmental changes external to the firm; and (3) effectively centralize the control of even the largest and most complex businesses. These benefits suggest that the question is not whether information systems should be used, but how to design and then employ the best one possible. Has 38 references.

R202553X67A

Dov, Aharon G Beged
MANAGEMENT SCIENCE, INFORMATION SYSTEMS, AND MANAGEMENT PRACTICE
IEEE Intl Convention Rec, Part 12, pp 83-93, N Y, N Y, Mar 1967. U of Toledo, Ohio, 11 p, 3 fig, 38 ref
DESCRIPTORS-- *decision making/ *systems analysis/ *planning/ management/ operations research/ scientific method/ coordination/ control/ simulation/ economics/ computers/ cost comparisons/ methodology/ characteristics/ data processing systems/ technology/ automation/ requirements/ bibliographies/ forecasting
IDENTIFIERS-- *information systems/ *systems engineering/ problem solving/ management planning/ goals/ reports

CIVIL ENGINEERING

R202544X67A CONCRETE COLLAR BRACES FOR LINING TUNNELS

Until recently, wooden collar braces were used between rib arches in tunneling practices in the USSR. Results of investigations and experiments using plant-manufactured reinforced concrete collar braces in construction of tunnels of the Ingursk Hydroelectric Powerplant are presented. These braces can be left in place when concreting tunnel linings, as they will not rot and form gaps between the rock and lining. Weight was an important design factor in the manufacture of the braces; each brace was not to exceed 16-20 kg. The method of manufacturing these braces is discussed, and a technical description with test results of experimental types of collar braces is given. Using reinforced concrete collar braces when driving nonpressure and pressure tunnels is recommended.

R202544X67A

Svanadze, P A
REINFORCED-CONCRETE COLLAR BRACES FOR LINING THE TUNNELS OF THE INGURSK HYDROELECTRIC POWER STATION. ASCE Hydrotech Construc, No 1, pp 17-20, Jan 1967. 4 p, 4 fig, 1 tab
DESCRIPTORS-- *tunneling/ *tunnel linings/ tunnel construction/ bracings/ foreign design practices/ reinforced concrete/ deflection/ manufacturing/ loads/ weight/ investigations/ bearing capacities/ laboratory tests/ pressure tunnels/ foreign construction
IDENTIFIERS-- USSR/ Ingursk Powerplant, USSR/ rock properties/ tunnel supports/ rock pressures

R202552 66A SOIL COMPACTION AROUND TUNNEL LININGS

The extrusion-cast concrete lining method is being used for tunnels driven through soil by the shield method. As the shield moves forward, concrete is fed into the space between an adjustable mold and the rear hood of the shield. A force-distributing ring compresses the concrete which in turn compresses the soil around the tunnel until the reaction of the ground equals the compressive force. In designing these tunnels, reaction of previously compressed soil on the tunnel lining can be calculated if stress distribution and dimensions of the active deformation zone in the ground are known. Full-scale studies of the size of the deformed zone were conducted on an experimental length of tunnel at the Biryulevo Station, Moscow. Investigations showed that the deformed zone is of limited size, in spite of the relatively great pressure exerted directly on the surrounding soil.

R202552 66A

Dorman, I Ya
EXPERIMENTAL INVESTIGATION OF SOIL COMPACTION ROUND A TUNNEL WITH AN EXTRUDED CAST-IN-SITU LINING. Soil Mech & Fdn Engg, No 3, pp 207-208, May-June 1966. 2 p, 3 fig
DESCRIPTORS-- *tunnel construction/ tunnel design/ foreign construction/ *tunnel linings/ *soil compaction/ soil consolidation tests/ void ratios/ tunneling/ concrete/ heaving/ deformation/ concrete placing/ sewers/ loams/ soil pressures/ tunnels/ cast-in-place structures/ compression
IDENTIFIERS-- USSR/ Biryulevo sewer, Moscow/ *concrete linings/ sandy loams

R202494 67A FORM LUMBER EFFECTS ON CONCRETE SURFACES

Deleterious effects, apparently produced by form lumber in contact with freshly placed concrete, have been experienced in the field on several occasions. Some wood constituents may be deleterious to concrete. Laboratory tests indicated that failure of a concrete surface to harden when in contact with a wood form is directly dependent upon: (1) concentration of the wood's reactive constituents, such as polysaccharides, tannins, and aliphatic and fatty acids; (2) availability of mixing and curing water; and (3) temperatures of concrete and wood forms. Suspect lumber, such as lumber produced from trees cut in the spring, should be tested by casting mortar against samples of the lumber to determine whether a deleterious reaction will result. Lumber suspected of containing a concentration of deleterious reactive constituents should be treated with 1 or more applications of lime water to reduce the concentration of these constituents prior to use in forms. This precaution is particularly important if concrete is to be water cured. Form oils should be thoroughly applied to all wood forms, particularly in the joints of each form.

R202494 67A

Pepper, L and Derrington, Clara F
DELETERIOUS EFFECTS OF FORM LUMBER ON CONCRETE SURFACES
Tech Rept 6-785, U S Army Engr Wtrwys Exper Sta, Corps of Engrs, Vicksburg, Miss, July 1967. 24 p, 2 tab, 8 ref
DESCRIPTORS-- *forms /concrete// *concrete/ *lumber/ *concrete technology/ *surfaces/ wood/ chemistry/ temperature/ acids/ oils/ concrete placing/ curing/ organic compounds
IDENTIFIERS-- effect/ *deleterious materials/ cement hydration

R202505 67A SONISCOPE TESTS ON CONCRETE DAMS

An evaluation of the soniscope as a diagnostic tool used in assessing concrete quality in structures is presented. Ultrasonic pulse velocity measurements were made on concrete dams in connection with the Portland Cement Association's development of the soniscope. Objectives of the program are to: (1) develop a nondestructive method for evaluating concrete quality, (2) explore the meaning of pulse velocity as it relates to concrete, and (3) obtain data for comparison with subsequent tests to determine if any changes are occurring in the concrete. Velocity measurements now may be made with an accuracy of 2% over paths up to 23 m long. Concrete deterioration may be detected by abnormally low velocities, a reduction in velocity over a period of time, or relatively large variations in velocity at different locations in the structure. Results from 10 of the 29 dams tested are discussed.

R202505 67A

McHenry, Douglas and Oleson, Calvin C
PULSE VELOCITY MEASUREMENTS ON CONCRETE DAMS
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 3, Ques 34, R 5, pp 73-89, Sept 1967. PCA, Skokie, Ill, 17 p, 11 ref
DESCRIPTORS-- *concrete dams/ *concrete testing/ ultrasonics/ longitudinal waves/ sonic waves/ concrete structures/ wave velocity/ inspection/ test procedures/ *nondestructive tests/ deterioration/ measuring instruments/ instrumentation/ cracking/ alkali-aggregate reaction
IDENTIFIERS-- *soniscopes/ ultrasonic tests/ Stewart Mtn Dam, Ariz/ Parker Dam/ Walters Dam, N C/ Matilija Dam, Calif/ Stony Gorge Dam, Calif/ Crystal Springs Dam, Calif/ Chickamauga Dam, Tenn/ *sonic velocity tests/ Arrowrock Dam, Idaho/ Norris Dam, Tenn/ Hiwassee Dam, N C

R202542X67A PETROGRAPHIC INVESTIGATIONS OF SAND

Rapid early stiffening of concrete having a very high water requirement caused difficulties during the construction of a large municipally owned hydroelectric project. Investigations showed that sand and gravel aggregates meeting ASTM specification requirements caused the early stiffening and high water requirement of the concrete. The sand suffered severe degradation during handling, mixing, and placing operations, producing a high percentage of fines containing a large amount of montmorillonoid clay minerals. Laboratory investigations featuring a special attrition test, mortar and concrete tests, petrographic analysis, absorption, specific gravity, and magnesium sulfate soundness test are described. The petrographic examination indicated that the sand was not suitable for high-quality concrete construction because of the presence of an abundance of deeply weathered and altered particles. Present ASTM specifications do not appear to be an adequate basis for judging the quality of concrete and mortar sands. The authors recommend that the specifications should include a petrographic report and an attrition test similar to the one described.

R202542X67A

Davis, R E; Mielenz, R C; Polivka, M
IMPORTANCE OF PETROGRAPHIC ANALYSIS AND SPECIAL TESTS NOT USUALLY REQUIRED IN JUDGING QUALITY OF CONCRETE SAND. Jour of Matls, Vol 2, No 3, pp 461-486, Sept 1967. U of California, Berkeley; Martin-Marietta Corp, Cleveland, Ohio, 26 p, 7 fig, 4 tab, 10 ref, disc
DESCRIPTORS-- *petrographic investigations/ *sands/ aggregates/ laboratory tests/ *fine aggregates/ concrete/ *concrete technology/ *stiffening/ test procedures/ slump/ portland cement/ specifications/ physical properties/ absorption/ specific gravity/ *abrasion/ degradation/ montmorillonites/ basalts/ acceptance tests/ *concrete testing/ materials testing/ mortars
IDENTIFIERS-- abrasion resistance/ abrasion method

R202543X67A CONCRETE WORKABILITY TESTS

CONCRETE TECHNOLOGY

The compacting factor, slump, Vebe consistometer, and settlement-time recorder used in conjunction with the Vebe apparatus are examined and compared as tests for determining the workability of fresh concrete. Results from experimental mixes show slump and compacting factor tests are not sensitive enough to show small variations in cement-water ratios. The Vebe consistometer is relatively more sensitive to small changes in mixes of medium workability and has good repeatability. Conversion of Vebe degrees and use of a settlement-time recorder were investigated as Vebe test modifications to improve Vebe test results. Conversion of Vebe time to Vebe degrees appears to be an unjustified refinement. The area under the settlement-time curve gives a measurement of cohesiveness rather than workability. Although these tests do not indicate all the individual properties collectively called workability, the Vebe test was found to give a very satisfactory indication of the ease in vibrating concrete into the shape of the formwork. Has 17 references.

R202543X67A

Hughes, B P and Bahramiam, B
WORKABILITY OF CONCRETE: A COMPARISON OF EXISTING TESTS
Jour of Matls, Vol 2, No 3, pp 519-536, Sept 1967. U of Birmingham, G B, 18 p, 9 fig, 2 tab, 17 ref
DESCRIPTORS-- *concrete/ *concrete testing/ *workability/ concrete placing/ concrete mixes// vibrators /mechanical// bibliographies/ compaction/ slump/ cohesion/ *consistency/ test procedures/ settlement/ water cement ratio/ concrete technology
IDENTIFIERS-- foreign testing/ foreign products/ Great Britain

R202515X67A VIBRATIONS FROM PILE DRIVING

CONSTRUCTION

Early investigations of vibration effect on structures were made by imposing vibrations directly on the structures; however, this method is impractical for typical construction sites surrounded by several structures. The Liberty Mutual Insurance Company, faced with the problem of these vibration effects, used ground vibration intensity as an indicator of potential structural damage. In 1936 the accelerograph was designed to measure and record ground vibrations resulting from construction operations. An energy ratio is calculated from the ground vibration recordings. Energy ratios above 6 are potentially damaging to structures. In pile driving, plotting energy ratio vs pile tip penetration with measurements at various distances is customary. When energy ratios above the safe level are encountered, proper precautions often can be taken to bring the energy ratio into the safe range.

R202515X67A

Luna, William A
AN ANALYSIS OF REPORTS ON GROUND VIBRATIONS DUE TO PILE DRIVING
Foundation Facts, Vol 3, No 2, pp 3-5, 1967. Liberty Mutual Ins Co, N Y, N Y, 3 p, 7 fig, 1 tab
DESCRIPTORS-- *vibrations/ *pile driving/ *accelerographs/ accelerometers/ structures/ buildings/ construction/ safety/ frequency/ longitudinal waves/ transverse waves/ shock waves/ seismic investigations/ energy/ *damages/ seismographs/ *piles/ *pile foundations
IDENTIFIERS-- ground amplitude/ ground particle velocity/ vibration tests

R202519X67A OPEN-PIT BLASTING PRACTICE

Open-pit blasting methods have undergone a drastic revolution in the past 25 yr. Large diameter boreholes and the use of ammonium nitrate fuel oil (AN/FO) and slurry blasting agents (SBA) have largely replaced the conventional dynamite loaded into small size boreholes. Although AN/FO is actually an inferior blasting agent, its success is attributable to its low cost, safety, and easy formulation and handling. Slurry blasting agents consist of a saturated ammonium nitrate solution mixed with a sensitizing material. The sensitizing material may be a nonexplosive combustible material or an oxygen deficient explosive such as TNT or smokeless powder. Slurry explosives are safe to handle as they are not easily ignited and are difficult to detonate without powerful boostering. Uses of AN/FO and SBA, automation in bulk handling, and economies in blasting are discussed. Commercial applications of nuclear explosives now in the planning stage may have advantages in large single-shot operations; however, most of these applications probably could be performed more economically with the new automated slurry systems in conjunction with modern automated construction methods. Has 22 references.

R202519X67A

Melvin, A; Garfield, M; Cook, Vernon O
MODERN OPEN-PIT BLASTING PRACTICE
Engg & Min Jour, Vol 168, No 9, pp 117-122, Sept 1967. IRECO Chemicals, Salt Lake City, Utah, 6 p, 2 fig, 3 photo, 1 tab, 22 ref
DESCRIPTORS-- blasts/ *explosives/ *mining/ quarrying/ nuclear explosions/ bibliographies/ detonation/ construction/ excavation/ handling equipment/ slurries/ automation/ costs// *charges /explosives// economies/ boreholes/ safety/ underground explosions/ fuel oils/ *rock excavation
IDENTIFIERS-- *open pit mining/ *ammonium nitrate/ *blasting

R202528X67A ENGINEERING CONSTRUCTION CONTRACTS

Based on today's economic conditions, a critical analysis is made of 12 different types of agreements used between contractors and operating companies. A selection chart evaluating the advantages, disadvantages, and most appropriate applications of these important types of contractual agreements for design and construction work is included. Relative popularity of the various types of agreements is discussed and latest trends in contract use in the U S and overseas are examined. Type of financing for domestic projects generally has little influence on the choice of contract form; however, project financing is a very important phase of contract selection for small foreign companies or government-owned monopolies in semideveloped countries. When a lending agency requires a detailed project execution plan, the contract form can be influenced considerably by the borrower's credit rating.

R202528X67A

Gallagher, John T
A FRESH LOOK AT ENGINEERING CONSTRUCTION CONTRACTS
Chem Engg, Vol 74, No 19, pp 218-224, Sept 11, 1967. Mobile Oil Corp, N Y, N Y, 6 p, 1 fig, 1 tab
DESCRIPTORS-- *contracts/ contract administration/ construction/ analysis/ agreements/ contracting/ negotiations/ costs/ finance/ economics/ design/ industries/ foreign construction/ engineering/ competitive bidding
IDENTIFIERS-- legal aspects/ incentives/ incentive contracting/ selection/ *evaluation

R202485X67A DERWENT DAM THE TEACHER

Derwent Dam, located on the Derwent River in a remote area of Northern England, is a 3000-ft-long, 119-ft-high earthfill structure containing 2.6 million cu yd of fill. The dam was built to provide 21 million gal of water per day for 2 local water companies. After construction started, design of the dam was changed from the original concrete-type cutoff to a clay blanket. Borehole explorations indicated a considerable depth of glacial deposit overlying a rock formation. During the first year of construction, contractors found 3 aquifers containing artesian water beneath the laminated clay stratum; dewatering one had little effect on flow of the others. Seven of 13 relief wells constructed at the downstream toe of the dam now provide approximately 10% of the statutory compensation water flowing downstream. Elaborate instrumentation was installed to check movements and pore pressures within the dam. A 60-kw hydraulic driven unit passes most of the downstream water requirement and supplies local electric power, as well as some excess which is fed into the public supply. The dam, construction areas, and reservoir have been landscaped carefully to blend with the surrounding countryside and are designated recreation areas.

R202485X67A

Anonymous
DERWENT DAM THE TEACHER
Engineering, Vol 204, No 5284, pp 140-144, July 28, 1967. 5 p, 13 fig
DESCRIPTORS-- *earth dams/ dam foundations/ dam design/ *cutoffs/ boats/ aquifers/ artesian water/ instrumentation/ glacial deposits/ construction/ clays/ foreign construction/ aesthetics/ recreation/ fish/ reservoirs/ boreholes/ geology/ *cutoff walls/ impervious blankets
IDENTIFIERS-- *landscaping/ dam stability/ *site selection/ Great Britain/ Derwent Dam, Gt Brit

R202493X67A BAJINA BASTA DEVELOPMENT--YUGOSLAVIA

The largest hydroelectric project in Yugoslavia is the 360-mw Bajina Basta Development. Located on the Drina, the country's second most important river for power potential, it is a project of major importance. Topography and geology of the area are described. To develop maximum river potential, 19 plants will be constructed eventually on the main stream with a number of others on the tributaries. Geology of the damsite is very complex, and considerable grouting was required to give a watertight foundation. As the foundation has a low modulus of elasticity (about 4000 kg/sq cm), a Marcello-type hollow-buttress dam with enlarged footings was necessary to give low foundation pressures. Construction and instrumentation of the dam, sliding joint between the dam and toe of the dam powerplant, penstocks and roller gates, semioutdoor powerplant construction, spiral cases, and mechanical and electrical equipment are described. The main circuit diagram of the Bajina Basta Powerplant and Beserovina Switchyard is included, and names of manufacturers of all major mechanical and electrical equipment are given.

R202493X67A

Anonymous
THE BAJINA BASTA DEVELOPMENT
Water Pwr, Vol 19, No 6-7, pp 219-225 & 261-265, June & July 1967. 12 p, 18 fig
DESCRIPTORS-- *hydroelectric powerplants/ dam foundations/ concrete dams/ *optimum development plans/ geology/ dam design/ *river basin development/ foreign projects/ hydrologic data/ instrumentation/ grout curtains/ power transformers/ geologic investigations/ electric generators/ aggregates/ hydraulic turbines/ hydraulic machinery/ grouting/ pozzolans/ *buttress dams/ Francis turbines// switchyards /electrical/
IDENTIFIERS-- Yugoslavia/ *Bajina Basta Dam, Yugosl/ site selection/ Drina River, Yugoslavia

R202497 67A LEAKAGE AT FONTENELLE DAM

The safety of Fontenelle Dam in Wyoming was threatened in 1965 when a substantial leak developed on the downstream face of the embankment at the right abutment contact. The leakage path was found to be through the abutment, although the first impression was that it was through the dam or along the contact. Emergency measures consisted of opening the main outlet which had been closed for minor repair and opening outlets on both abutments leading to canal systems that had not been constructed. The prompt action lowered the reservoir before erosion from the flow could cause a breakthrough. The difficulty occurred on first filling of the reservoir, unusually rapid because of extremely large inflows. Repairs consisted of thorough grouting of the foundation and restoration of the embankment damaged by the sudden flow. The experience illustrates the need for slow, controlled filling of reservoirs where unfavorable foundation conditions are known to exist. Foundation conditions, design, and construction practices are examined to determine why this situation developed despite the precautions taken in the original design and construction because of known unfavorable geologic conditions. Modifications needed to prevent a recurrence at this dam and other similar sites are discussed.

R202497 67A

Bellport, B P
BUREAU OF RECLAMATION EXPERIENCE IN STABILIZING EMBANKMENT OF FONTENELLE EARTH DAM. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 5, pp 67-79, Sept 1967. Bureau of Reclamation, Denver, Colo, 13 p, 3 fig
DESCRIPTORS-- *earth dams/ *embankments/ *leakage/ abutments/ *repairing/ grouting/ dam design/ foundations/ foundation failures/ geology/ bedrocks/ foundation investigations/ geologic investigations/ reservoir operation/ damages/ stress relieving/ underseepage/ dam failures/ engineering geology/ seepage
IDENTIFIERS-- *Fontenelle Dam, Wyo// *piping /erosion// jointed rock

R202499 67A UPLIFT PRESSURES IN RESERVOIR SLOPES

During initial filling of Gepatsch Reservoir, Austria, extensive slope movements were observed along the western slope. Volume of the slope mass in movement was estimated at 20 million cu m. The geological situation at the basin, laboratory tests, field measurements and observations, model tests, and theoretical studies are described. The investigations revealed that uplift pressure produced by filling the reservoir was the main cause of slope movements. Model tests and calculations indicated that through a process of slow deformation the slope is adapting to load conditions modified by the reservoir level. Forecasts of further movements were made and checked during a second filling of the reservoir. Under strict surveillance, the full reservoir level was reached step by step in 2 further filling periods.

R202499 67A

Lauffer, H; Neuhauser, E; Schober, W
UPLIFT RESPONSIBLE FOR SLOPE MOVEMENTS DURING THE FILLING OF THE GEPATSCH RESERVOIR. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 41, pp 669-693, Sept 1967. Tiroler Wasserkraftwerke AG, Innsbruck, Austria, 25 p, 9 fig, 2 tab, 7 ref
DESCRIPTORS-- reservoirs/ *slopes/ *earth movements/ valleys/ engineering geology/ geologic investigations/ model tests/ rheology/ moraines/ talus/ glacial deposits/ *uplift pressures/ movements/ sliding/ buoyancy/ *slump/ measurement/ measuring instruments/ galleries/ alluvial deposits/ foreign projects/ *landslides
IDENTIFIERS-- *slope stability/ slip surface/ *rockslides/ Gepatsch Reservoir, Austria/ Austria

R202503 67A BRATSK DAM STRUCTURAL BEHAVIOR

The Bratsk Dam is a concrete gravity structure of triangular cross section with a maximum height of 126 m. It is located in the region of Eastern Siberia where the annual mean air temperature is -2.7 deg C, extreme temperatures are -58 deg C and +35 deg C, and the frost period continues for more than 6 months. A continuous observation program calls for measurement of the temperature; strain and stress in the concrete; and settlement, deflections, and uplift of the dam. The stress condition is affected by temperature changes and dead weight of the structure. Influence of hydrostatic pressure on stresses measured by strain meters is slight; cracking in the concrete occurred mostly on the surface at an early age. Maximum settlement of the dam is 63 mm and is expected to reach 73 mm. Deflections of the dam are seasonal because of temperature variations. Irreversible downstream deflections are caused by hydrostatic pressure and temperature variations.

R202503 67A

Eidelman, S Ya and Vedeneev, B E
MEASUREMENTS OF DEFORMATIONS AND STRESSES ON THE BRATSK DAM ON THE ANGARA RIVER. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 3, Ques 34, R 32, pp 571-590, Sept 1967. VNIIG, Leningrad, USSR, 20 p, 6 fig, 2 tab, 14 ref
DESCRIPTORS-- *concrete dams/ *measurement/ *deformation/ *stress/ weight/ cold weather operations/ temperature/ dam design/ foreign design practices/ foreign construction/ displacements/ settlement/ loads/ deflection/ cracks/ *strain measurement/ cracking/ strain gages/ *structural behavior/ thermal stress/ reservoir operation/ instrumentation/ gravity dams
IDENTIFIERS-- *Bratsk Dam, USSR/ USSR/ cold climates

R202504 67A DAM FAILURE CAUSES

Knowledge of causes leading to the destruction of dams is incomplete, and further progress must be based upon a close study of the mechanism of failure. Our knowledge has not yet reached the stage when the safety of a dam can be secured by following a uniform code of practice. Every dam, whether natural or man-made, interferes with the established equilibrium of nature and gives rise to slow changes eventually leading to the restoration of the natural potential gradients interrupted by the dam. The risk of disaster is forever inescapable, and while knowledge and vigilance may reduce such a risk, it can never be banished entirely. Although dams are designed on the assumption of a system of static loads, they are in fact subject to slow dynamic change and should be observed throughout their period of service.

R202504 67A

Gruner, Edward
THE MECHANISM OF DAM FAILURE
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 3, Ques 34, R 12, pp 197-206, Sept 1967. 10 p
DESCRIPTORS-- *dam failures/ safety/ dams/ disasters/ *foundation failures/ defects/ deformation/ seepage/ leakage/ grouting/ abutments/ flood damages/ flood/ costs/ grout curtains/ earthquakes/ uplift pressures/ inspection/ dam foundations// failure /mechanics// earth dams/ arch dams/ concrete dams
IDENTIFIERS-- piping /erosion/

R202506 67A SPILLWAY AND OUTLET DAMAGES

Specific examples of erosion and structural damage sustained by spillways and outlets at Bureau of Reclamation dams are reported. At 2 large dams, concrete-lined spillway tunnels used for river diversion during construction suffered extensive erosion from river gravel and construction debris churned in the turbulent hydraulic jump. Rock debris fallen or thrown into a spillway hydraulic jump stilling basin caused extensive erosion of the floor, walls, and dentates. An example is cited of serious cavitation damage to concrete surfaces in hydraulic jump outlet stilling basins caused by improperly installed outlet gates and poor workmanship. At 3 projects, erosion and structural problems were encountered with high-efficiency hollow-jet valve stilling basins. Channel riprap was dislodged and conveyed by reverse roller action into the basin, devastating the basin floor and walls. The intense turbulence in hollow-jet valve basins imposes high dynamic forces on divider walls, producing high bending moments and vibrations approaching a resonance condition. The knowledge gained from these experiences has led to changes in design and construction procedures for stilling basins. Techniques for corrective and preventive maintenance are discussed.

R202506 67A

Arthur, H G and Jabara, Melvin A
PROBLEMS INVOLVED IN OPERATION AND MAINTENANCE OF SPILLWAYS AND OUTLETS AT BUREAU OF RECLAMATION DAMS. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 2, Ques 33, R 5, pp 73-93, Sept 1967. Bureau of Reclamation, Denver, Colo, 21 p, 4 fig
DESCRIPTORS-- *spillways/ *outlet works/ *erosion/ cavitation/ maintenance/ damages/ riprap/ gravels/ diversion tunnels/ turbulence/ hydraulic jumps/ hollow jet valves/ *stilling basins/ energy dissipation/ hydraulic models/ resonance/ vibrations/ design criteria/ operation and maintenance/ *scour/ hydraulic structures/ dentated sills/ dams
IDENTIFIERS-- concrete linings/ Bureau of Reclamation/ design improvements/ dynamic loads

R202507 67A SAFETY OF DAMS PROGRAM OF THE USBR

The broad experience gained by the Bureau of Reclamation in constructing and operating over 200 storage dams in the 17 Western States has resulted in a comprehensive system of procedures to assure their safety. All criteria and instructions for operation and maintenance of each dam are being assembled in a volume containing: (1) administrative procedures for reporting, decision making, and coordinating with other agencies; (2) detailed information and instructions on the operation and maintenance of the dam and related facilities; and (3) reservoir operating criteria including storage allocations, filling and release procedures, hydrologic forecasting, and flood operating criteria. Maintenance at each dam is reviewed by project supervisors and engineers periodically. A program is in progress to review flood hydrology for older dams to determine adequacy of spillways. Consideration is given to geologic and seismic conditions and possible alkali-aggregate reaction in concrete at older structures. The competence of dams designed and constructed by local interests above Reclamation dams is being cooperatively reviewed. Reclamation is urging Federal legislation to assist in preventing and correcting dangerous conditions at all storage dams.

R202507 67A

Dominy, Floyd E
THE SAFETY OF DAMS PROGRAM OF THE BUREAU OF RECLAMATION
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 2, Ques 33, R 4, pp 57-72, Sept 1967. Bureau of Reclamation, Washington, D C, 16 p, 2 tab, append
DESCRIPTORS-- *safety/ *dams/ *concrete dams/ operation and maintenance/ *earth dams/ instruction/ operations/ maintenance/ seismic design/ laws/ spillways/ alkali-aggregate reaction/ hydrologic data/ landslides/ programs
IDENTIFIERS-- Bureau of Reclamation/ irrigation districts/ operating criteria/ standing operating proced/ hydrothermograms

R202508 67A SEISMIC DESIGN CRITERIA FOR CONCRETE DAMS

Any dam may be subjected to seismic disturbance of unknown intensity during its useful life. The engineer must consider earthquakes in his design and provide sufficient resistance to this phenomenon. Three major problems are encountered when selecting design criteria for concrete dams subjected to earthquake: (1) a method for analyzing the dynamic response of the structure and the resulting loads, (2) a definition of structural failure under seismic loads, and (3) selection of criteria based on these items. Based on the premise that concrete dams are elastic structures and can be excited to resonance by earthquakes, a method is presented for determining dynamic loads and computing the resulting stresses. The earthquake response spectrum concept is used, and hydrodynamic effects, structural damping, and dynamic response of the dam are included. Results of a controlled vibration test are compared with estimated dynamic properties for one arch dam. The possibility and degree of structural failure are investigated because of the development of relatively large stresses from dynamic loading. Design criteria are proposed, based on compressive strength of concrete as the most important measure of the strength of the dam.

R202508 67A

Copen, Merlin D
SELECTION OF DESIGN CRITERIA FOR CONCRETE DAMS SUBJECTED TO SEISMIC ACTION
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 4, Ques 35, R 14, pp 239-258, Sept 1967. Bureau of Reclamation, Denver, Colo, 20 p, 7 fig, 12 ref
DESCRIPTORS-- *concrete dams/ *dam design/ *seismic design/ damping/ elastic deformation/ earthquakes/ *design criteria/ natural frequency/ resonance/ vibrations/ compressive strength/ tensile strength/ structural stability/ stress/ arch dams/ dynamics
IDENTIFIERS-- seismic stability/ dynamic stability/ earthquake loads/ dynamic tests/ *earthquake engineering/ earthquake-resistant struct

R202510 67A SEISMIC ANALYSIS OF EARTH DAMS

Rational, analytical methods of design have yielded an increased understanding of dynamic conditions affecting dam stability. A statistical approach to prediction of earthquake magnitude at a given site is available, and knowledge of soil strength under dynamic conditions is expanding rapidly. Although a statistical study of earthquake probability is a prerequisite to seismic design of an earth dam, the engineer must realize limitations of the study and use good judgment in applying results. Probability data extracted from earthquake historical records showing only minor activity in an area must be adjusted if the geological evidence indicates extensive fault movement during recent geological times. Results of the seismic stability analysis will indicate extent of design modifications desirable to increase the safety factor of the proposed section. Where excessive displacements are indicated, the embankment slope should be flattened, increased densities should be specified and, if necessary, shell material should be processed to remove fines. Further research on seismic characteristics is required to enable the engineer to decrease the available range of each parameter to be assumed for his analysis. Among the most influential on earth dam behavior are the frequency and duration of vibrations. Gives 30 references.

R202510 67A

Stone, A A and Smith, E S
PRACTICAL APPLICATION OF DYNAMIC CRITERIA TO SEISMIC ANALYSIS OF EARTH DAMS
Paper, Trans, 9th Intl Cong on Large Dams, Vol 4, Ques 35, R 15, pp 259-280, Istanbul, Turkey, Sept 1967. Intl Engg Co, Inc, San Francisco, Calif, 22 p, 6 fig, 2 tab, 30 ref
DESCRIPTORS-- *earth dams/ *seismic design/ dynamics/ *rockfill dams/ model tests/ soil physical properties/ earth movements/ earthquakes/ embankments/ structural behavior/ probability/ displacements/ bibliographies/ design criteria/ vibrations/ shear stress/ *dam design/ safety factors/ slopes
IDENTIFIERS-- *seismic stability/ dynamic tests/ *dynamic stability// acceleration /mechanical// epicenters/ *earthquake-resistant struct/ design earthquake/ earthquake engineering

R202530X67A RIVER DIVERSION AT FURNAS

River control works, comprising cofferdams, 2 diversion tunnels, and a prediversion channel, were used to divert the Rio Grande prior to construction of the rockfill dam for Brazil's 1200-mw Furnas hydroelectric development. A prediversion channel in the right bank was provided so that work in the deep-faulted section of the riverbed could begin at an early date. This channel passed floods of 2700 cu m/sec. Site geology, riverflows, frequency and volume of floods, river control, cofferdams, model studies and flow tests, and diversion tunnel construction are discussed. The twin horseshoe-shaped diversion tunnels, each with an average cross section of 171 sq m and lengths of 885 and 806 m respectively, were driven through quartzitic rock of the left bank. The tunnels were lined with reinforced sprayed concrete supported by rockbolting. Maximum recorded flow through the tunnels was 4040 cu m/sec and occurred during Feb 1961.

R202530X67A

MacGregor, W; Lee, T A; Hancock, P H D
RIVER DIVERSION AT FURNAS
Water Pwr, Vol 19, No 9, pp 377-386, Sept 1967. George Wimpey & Co Ltd, London, G B, 10 p, 15 fig, 3 tab, 5 ref
DESCRIPTORS-- *diversion tunnels/ diversion/ *cofferdams/ streamflow/ *river closures/ river basin development/ rockfill dams/ hydroelectric power/ rock bolts/ flood/ flood peaks/ tunnels/ tunnel linings/ hydraulic models/ model tests/ hydraulics/ roughness coefficients/ velocity/ river regulation/ foreign construction/ geology
IDENTIFIERS-- Brazil/ Furnas Dam, Brazil/ *concrete linings

R202531X67A EARTHQUAKE LOADS ON BUTTRESS DAMS

An analytical study showing use of the finite element method for vibration and stability analysis of buttress dams is presented. Salient points of the method are reviewed and an example of an Ambursen-type dam with variable web thickness is given. Relative stiffness of a buttress dam in the transverse direction, coupled with flexibility along the longitudinal axis, allows vibrations to be studied as those of supported plates subject to flexure. Only the elastic response is determined. Focusing attention on natural vibrations simplifies design changes to minimize response effects. Once free vibration frequencies and modes are known, standard methods are available for computing the response to any specific motion. Basic procedures for determining the response to a specific earthquake are summarized in an appendix.

R202531X67A

Zienkiewicz, O C; Anderson, G; Irons, B
BUTTRESS DAM ANALYSIS FOR EARTHQUAKE LOADS
Water Pwr, Vol 19, No 9, pp 359-362, Sept 1967. U of Wales, Swansea, G B, 4 p, 6 fig, 6 ref
DESCRIPTORS-- *buttress dams/ concrete dams/ *stability analysis/ computer programming/ mathematical analysis/ computation/ natural frequency/ *dam design/ earthquakes/ *vibrations/ matrix algebra/ foreign design practices
IDENTIFIERS-- *finite element method/ earthquake engineering/ *earthquake loads/ Great Britain

R202556X67A ARCH DAM DESIGN FACILITATED BY COMPUTER

A computer application is used to simplify the layout of a variable thickness, double-curvature arch dam. With prescribed though flexible relationships given for the angles subtended, thickness variation, and crown-to-abutment overhang, a computer program determines the centers and radii of intrados and extrados arcs and cross-sectional dimensions. In this way, a rapid evaluation of the many factors affecting dam geometry can be made. To demonstrate the technique, results are tabulated for a 675-ft-high arch dam with defined contours. A graphical representation of the computer layout and the idealized profile superimposed on the estimated profile are shown. These profiles closely approximate the valley. The procedure outlined is one of many and was selected because the engineer starts the design with optimum subtended angles. Usually a single trial is sufficient to determine whether these angles can be maintained without excessive vertical curvature. Necessary modifications can be spotted easily. This procedure simplifies the difficult task of satisfying tensile strength requirements and can be used as a basis for a grid analysis or field survey, since any point can be defined precisely.

R202556X67A

Parme, Alfred L
ARCH DAM LAYOUT FACILITATED BY USE OF COMPUTER
ASCE Proc, Jour Pwr, Vol 93, No PO2, Paper 5523, pp 69-85, Oct 1967. Portland Cement Assoc, Chicago, Ill, 17 p, 8 fig, 4 tab, 1 ref, 2 append
DESCRIPTORS-- *arch dams/ *dam design/ structural design/ dams/ computer programming/ concrete dams/ hydraulic structures/ locations/ shell structures/ abutments/ contours/ stress analysis/ analysis/ deformation/ cross sections/ hydrostatic pressures/ graphical analysis/ loads/ moments/ thickness/ geometry/ stress/ tensile strength
IDENTIFIERS-- curvature/ design practices/ double-curvature arch dams

R202486X67A RANNEY METHOD LIFTS WATER FROM AQUIFERS

Using the Ranney method, a water well system can be developed in alluvial deposits of sand and gravel along riverbeds. The installation consists of sinking a reinforced concrete caisson through sand and gravel to an impermeable layer and then jacking slotted pipes horizontally in radial directions into the surrounding alluvial material. During the jacking of the slotted pipes, surrounding gravels are desanded to form an infiltration gallery. A pumphouse with control equipment, valve controls, and recording equipment is constructed on top of the caisson extending several feet above ground level. This arrangement prevents floodwater from entering the caisson or pumping station and polluting the filtered water. A single Ranney collector can produce as much water as several standard wells and the yield will not deteriorate because of silting or encrustation. As the collector draws from natural underground storage or water infiltrated from an underground river, there is usually no need to establish any surface storage. Steps for installing a collector with its equipment and a method of operation are described.

R202486X67A

Drinkwater, J S
THE RANNEY METHOD OF ABSTRACTING WATER FROM AQUIFERS
Water & Water Engg, Vol 71, No 857, pp 267-274, July 1967. Humphreys & Glasgow Ltd, London, G B, 7 p, 6 fig, 4 photo, 2 ref
DESCRIPTORS-- *aquifers/ *ground water/ pipes/ caissons// filters /fluid// pumps/ water yield/ tunneling/ slots/ filtration/ collecting method/ water supplies/ *wells/ alluvial deposits
IDENTIFIERS-- *Ranney collector/ pumping tests/ perforations/ jacking/ radial collector wells/ site selection/ Great Britain/ water wells

R202496X67A ALUMINUM SHEATH EXTRA-HIGH-VOLTAGE CABLES

Siemens AG, Berlin, Germany, has developed a sheathing press for manufacturing aluminum-sheathed power and telecommunications cables. During the past 10 yr, 15,000 km of cable have been manufactured and tested in European installations. Advantages of aluminum- over lead-sheathed cables are: (1) aluminum is stronger mechanically; (2) electrically, aluminum has higher conductivity, thus making possible the use of aluminum sheathing as a neutral conductor in 3-phase cables and offering a substantial savings in cost; (3) aluminum-sheathed cable is lighter per unit length; (4) aluminum offers better shielding effects for communications cables; and (5) aluminum-sheathed cable is more economical. The only disadvantage of aluminum over lead is that it is more sensitive to corrosion; however, with the reliability and quality of anticorrosion protective coverings this disadvantage becomes almost nonexistent. A general review of the use of aluminum as sheathing material for single-conductor, extra-high-voltage cables is given. Relative merits of oil-filled aluminum- and lead-sheathed cables are discussed and jointing methods described.

R202496X67A

Muller, U and Held, Ch
EXTRA HIGH VOLTAGE CABLES WITH ALUMINUM SHEATH
Paper 31 CP 67-480, IEEE Summer Pwr Mtg, Portland, Oreg, July 1967.
Siemens AG, Berlin, Germany, 15 p, 8 fig, 4 ref
DESCRIPTORS-- *extra high voltage/ *electric cables/ *aluminum/ *sheathing/ corrosion/ corrosion control// lead /element// electrical conductance/ joints/ foreign design practices/ mechanical properties/ electric power/ electrical properties/ thermal properties/ economies/ reliability/ losses/ costs/ weight
IDENTIFIERS-- Germany/ *power cables/ foreign research

R202518 66A NONSUSTAINED BREAKDOWNS IN DIELECTRICS

For over 50 yr, preliminary or pilot sparks have been observed with alternating voltages during breakdown tests of gaseous and liquid insulation. Frequently occurring in oil gaps, these sparks usually were regarded as spurious and the higher voltage resulting in the sustained flow of current was recorded as the dielectric strength. Although this practice has been accepted in many standards, recent findings indicate preliminary sparks observed across long insulator strings and rod-rod gaps result in a momentary collapse of voltage to near zero across the test object. The more general occurrence of the sparking phenomenon is demonstrated, and the question of which breakdown voltage should be used to designate the dielectric strength is reconsidered. Sustained and nonsustained breakdowns are defined and oscillograms of typical breakdown phenomena for SF6 and transformer oil are included.

R202518 66A

Darveniza, M
NONSUSTAINED BREAKDOWNS IN ELECTRICAL STRENGTH TESTS
Paper, 1966 Ann Rept, Conf on Elec Insulation & Dielec Phenomena, pp 39-44, Pocono Manor, Pa, Oct 1966. Westinghouse Res Labs, Pittsburgh, Pa, 6 p, 4 fig, 2 tab, 8 ref
DESCRIPTORS-- alternating currents/ *dielectrics/ electric potential/ test procedures/ *electric insulation/ electric arcs/ electrodes/ experimental data/ standards/ electrical engineering/ capacitors/ resistors/ oils/ contamination// transmission /electrical// sparks
IDENTIFIERS-- *breakdown/ *insulating oil/ *sulfur fluorides/ switching surges/ electrical insulators/ test results/ polarity

R202540X67A INSULATION CHARACTERISTICS OF EHV LINES

Results of tests for the insulation design of the first 500-kv transmission line in Japan are described. These tests were conducted on a full-scale transmission line constructed near the seashore where insulators are exposed to salt contamination. The contamination lowers the withstand voltage of insulators and causes earlier flashover. Switching surge and impulse flashover characteristics of V-string and strain insulator assemblies were clarified and the insulators installed on a simulated tower with a long gap of 3 m or more. Tower insulation capable of unbalanced insulation between vertically arranged double circuits was designed to withstand a switching surge of 2.5 per unit. Tests included the investigation of impulse flashover voltage characteristics, switching surge flashover voltage characteristics, switching surge flashover path, and predischarges. Tables and graphs of test results are presented.

R202540X67A

Saruyama, Y; Yasui, M; Ikeda, G, et al
500-KV LINE DESIGN: I--INSULATION CHARACTERISTICS OF TOWERS
IEEE Trans, Vol PAS-86, No 9, pp 1083-1090, Sept 1967. Tokyo Elec Pwr Co, Japan; Sumitomo Elec Ind, Ltd, Osaka, Japan, 8 p, 14 fig, 2 tab, 11 ref, append, disc
DESCRIPTORS-- *extra high voltage/ *transmission lines/ *electric insulation/ design/ clearances/ foreign design practices/ characteristics/ lightning/ test procedures/ electrical coronas/ radio interference/ surges/ test facilities/ contamination
IDENTIFIERS-- switching surges/ Japan/ electric discharges/ *flashover/ test transmission lines/ *electrical insulators

R202541X67A CORONA & RIV CHARACTERISTICS OF EHV LINES

Corona noise, produced by conductors and insulator hardware, causes radio interference on power transmission lines. Noise characteristics of insulator-hardware assemblies used in designing the first 500-kv transmission line in Japan are described. Results of corona noise measurement made on V-string and strain insulator assemblies are compared for: (1) insulators only, (2) insulators with an arcing horn, and (3) insulators with an arcing horn and shielding rings. Data on the corona noise level of insulator hardware, obtained from a test line, were converted into noise level values for an actual transmission line and compared with conductor noise levels; insulator-hardware design for the 500-kv line was decided accordingly. Corona noise level measurements were made under both dry and wet conditions.

R202541X67A

Saruyama, Y; Yasui, M; Nagasaki, S
500-KV LINE DESIGN: II--CORONA AND RIV CHARACTERISTICS OF INSULATOR-HARDWARE ASSEMBLIES. IEEE Trans, Vol PAS-86, No 9, pp 1091-1097, Sept 1967. Tokyo Elec Pwr Co, Japan; Sumitomo Elec Ind, Ltd, Osaka, Japan, 7 p, 12 fig, 1 tab, 8 ref, append, disc
DESCRIPTORS-- *electrical coronas/ *radio interference/ characteristics/ *extra high voltage/ transmission lines/ foreign design practices/ design/ test facilities/ test procedures/ magnetic fields/ shielding/ high frequency/ electric insulation/ noise/ electric cables
IDENTIFIERS-- Japan/ *electric discharges/ test transmission lines/ electric conductors/ electrical insulators

R202498 67A FOUNDATION DEFORMATION & ARCH DAM DESIGN

Foundation and structural behavior studies on the arch section of Alto Rabagao Dam are summarized. Located in Northern Portugal, the dam is a 94-m-high, double-curvature, asymmetric cupola. The foundation rock is granite and ranges from good condition in the right bank to a kaolinized and highly deformable condition in the left bank. Ratio of foundation rock to dam concrete modulus of elasticity ranged from 1:1 on the right bank to 1:20 under the left abutment. A rock quality index based on water absorption was correlated with mechanical properties and used to reduce the number of tests and to evaluate rock properties during excavation. Model tests of dam shapes with variations in foundation conditions showed that high deformability in the left bank caused high-tensile stresses parallel to the foundation surface in the downstream face near the left bank foundation and near the lower part of the right bank on the upstream side. These high-tensile stresses were almost entirely offset by choosing shapes to increase the thickness and weight of the dam. The authors contend that an arch dam is less expensive and safer than a gravity dam; contrary to current opinion, an arch dam does not require better foundations in regard to deformability or strength.

R202498 67A

Rocha, Manuel; da Silveira, A F; Azevedo, M C Cruz; Lopes, J Baptista
INFLUENCE OF A VERY HIGH DEFORMABILITY OF THE FOUNDATION ON THE CONCEPTION AND BEHAVIOUR OF AN ARCH DAM. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 28, pp 441-461, Sept 1967. LNEC, Lisbon, Portugal, 20 p, 11 fig, 2 tab, 5 ref
DESCRIPTORS-- *dam design/ *arch dams/ *dam foundations/ foundation investigations/ *structural models/ model tests/ granites/ deformation/ elasticity modulus/ tensile stress/ foreign projects/ foreign design practices/ abutments/ absorption/ index tests/ stress analysis/ rock foundations/ safety
IDENTIFIERS-- rock properties/ rock alteration/ double-curvature arch dams/ Alto Rabagao Dam, Portugal/ Portugal

R202500 67A DEEP CUTOFF SLURRY TRENCHES

Cutoffs for dams using the open cut compacted core trench method become expensive or impractical when the foundation alluvium is deep or dewatering is difficult. In situations requiring a deep cutoff, the slurry trench method has proved successful in a number of cases. The method consists of excavating, in the wet, a trench with vertical sides supported by bentonite slurry. As materials are removed from the trench, sufficient slurry is added so that the trench always remains full. After a length of trench has been excavated, backfilling with selected materials is started while the slurry is still in the trench. Design of a slurry trench cutoff, trench bottom treatment, slurry mixing, backfill composition, and construction procedures are discussed. At sites with excessively deep alluvium, the cutoff may be extended economically by combing the slurry trench with a grouted cutoff. A brief comparison of cutoffs for 10 dams in the U S, Canada, West Pakistan, and Surinam is given, and design and construction of the slurry trench cutoff for Wanapum Dam in Washington are cited.

R202500 67A

Jones, Jack C
DEEP CUTOFFS IN PERVIOUS ALLUVIUM, COMBINING SLURRY TRENCHES AND GROUTING
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 31, pp 509-523, Sept 1967. Harza Engg Co, Chicago, Ill, 15 p, 2 fig, 1 tab
DESCRIPTORS-- *cutoff trenches/ earth dams/ fills/ alluvial deposits/ dam design/ *dam foundations/ bentonites/ *slurries/ construction/ excavation/ backfills/ foreign projects/ grouting/ costs/ grout curtains/ cutoffs
IDENTIFIERS-- Wanapum Dam, Wash

R202501 67A BEDROCK STABILITY AT PLACE MOULIN DAM

Place Moulin Dam in Italy is a 155-m-high, double-curvature, arch-gravity dam. Geology of the damsite and safety of rock-supported concrete abutments, with emphasis on variations of foundation rock properties with time, are discussed. Structural model tests of the dam and foundation rock verified the stability of the rock abutments. Grouting procedures for waterproofing the bedrock are covered briefly. Static tests were performed to measure rock deformations produced by hydrostatic pressure test chambers in galleries located in the dam abutments; supplementary jacking tests were conducted also. Seismic tests were made to obtain dynamic elasticity modulus values along the dam foundation, and supplementary measurements were accomplished with ultrasonic core tests. A permanent instrumentation system was installed in galleries in the dam abutments and foundation for measuring changes in displacements and pressures with time.

R202501 67A

Oberti, G and Rebaudi, A
BEDROCK STABILITY BEHAVIOR WITH TIME AT THE PLACE MOULIN ARCH-GRAVITY DAM
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 52, pp 849-872, Sept 1967. Polytech Inst, Turin, Italy; ENEL, Venice, Italy, 24 p, 15 fig, 1 tab
DESCRIPTORS-- bedrocks/ *rock foundations/ *dam foundations/ arch dams/ abutments/ safety/ geologic investigations/ engineering geology/ foreign design practices/ grouting/ static tests/ hydrostatic pressures/ elasticity modulus/ foreign projects/ seismic investigations/ deformation/ concrete dams/ instrumentation/ rock mechanics/ *foundation investigations
IDENTIFIERS-- in situ tests/ pressure chamber test/ rock properties/ Italy/ Place Moulin Dam, Italy

R202525 67A SETTLEMENT OF LOESS FOUNDATIONS

Field tests were conducted to determine settlement of loess foundations under low loads caused by hydraulic structures of irrigation systems. The natural settlement was measured in a 45- x 50-m pit. A pyramid-shaped earth embankment, 6 m high with a 27- x 30-m base, was located in the center of the pit. The pit was filled with water to a depth of 1 m and settlement measurements were taken on the unloaded area of the pit and under the embankment. Duration of wetting was 110 days; settling occurred for 370 days. The base of the embankment settled 207 cm in 1 year; settlement decreased with depth. The bottom of the pit settled 183 cm under zero load, while the top layer of the soil, 5 m deep, shifted with the soil surface without consolidation. Measured bottom settlements caused by soil weight were in agreement with those calculated from volume strains obtained in the triaxial test and exceeded those calculated from consolidation tests by 16%. Method and formulas for computing settlement are given and results compared with measured settlement.

R202525 67A

Pilyugin, A I
SETTLEMENT OF LOESS FOUNDATIONS UNDER CANAL EMBANKMENTS
Proc, 3rd Asian Regional Conf on Soil Mech & Fdn Engg, Vol 1, Div 1-7, pp 29-32, Haifa, Israel, Sept 1967. VODGEO Inst of State Bldg Committee of USSR, Moscow, 4 p, 5 fig, 1 tab, 3 ref
DESCRIPTORS-- *loess/ *settlement/ *foundations/ *canal embankments/ embankments/ loads/ loading time/ field tests/ consolidation/ measurement/ land subsidence/ pits/ ponding tests/ soil consolidation tests
IDENTIFIERS-- USSR/ foreign research/ triaxial tests/ wetting

FOUNDATIONS

R202526 67A FOUNDATION PROBLEMS IN LOESS SOILS

Vast areas of eastern Europe and southern and central Asia are covered with fine-grained sedimentary soil known as loess; in depth, it often exceeds 50 m. All loess-type soils are characteristically subject to considerable additional settlement on increase in water content, thereby giving rise to numerous foundation problems in all types of structural design and irrigation systems. Laboratory and field investigations on the relationship between specific additional settlement and soil parameters are described; e.g., mineralogical composition, grain-size distribution, porosity, moisture content, and degree of saturation. Recommendations for foundation design and construction are made, and effective means for improving mechanical and physical properties of loess and eliminating its sensitivity to wetting are discussed.

R202526 67A

Lehr, H
FOUNDATION ENGINEERING PROBLEMS IN LOESS SOILS
Proc, 3rd Asian Regional Conf on Soil Mech & Fdn Engg, Vol 1, Div 1-7, pp 20-24, Haifa, Israel, Sept 1967. Inst of Construction, Bucharest, Rumania, 5 p, 5 fig, 2 tab, 3 ref
DESCRIPTORS-- *loess/ *settlement/ *foundations/ *foundation failures/ soil compaction/ models/ porosity/ piles/ structural behavior/ moisture content/ compaction/ field tests/ laboratory tests/ soil physical properties/ grain sizes/ saturation/ land subsidence
IDENTIFIERS-- wetting/ Europe/ Asia

GEOLOGY AND GEOPHYSICS

R202511X67A ARID REGION ALLUVIAL FANS

Processes acting on alluvial fans and the features produced by these processes were studied in the field and laboratory. The field study involved geomorphic mapping; measurement of channel cross sections; and observations of weathering phenomena, debris size, and lithology. In the laboratory, small alluvial fans were built of mud and sand. This study focused attention on aspects of fan morphology that might otherwise have been overlooked or misidentified in the field. Material was transported to fans by debris flow or waterflow along a main channel. The channel was generally incised at the fan head but emerged onto the surface at a point about midway down the fan. On laboratory fans, most deposition above this point is by debris flow; fluvial deposition dominates below the point. On fans deficient in fine materials, large discharges may completely infiltrate the fan and deposit coarse debris as sieve deposits. Criteria for recognizing and distinguishing debris flow deposits and sieve deposits are given. Has 23 references.

R202511X67A

Hooke, Robert L
PROCESSES ON ARID-REGION ALLUVIAL FANS
Jour of Geol, Vol 75, No 4, pp 438-460, July 1967. U of Minnesota, Minneapolis, 25 p, 10 fig, 5 tab, 2 plate, 23 ref, append
DESCRIPTORS-- *alluvial deposits/ *geologic investigations/ particle size/ *geology/ *geomorphology/ deposition/ *arid land/ stream channels/ deserts/ weathering/ slopes/ sieve analysis/ *sediment transport/ hydraulic models/ channeling/ bibliographies/ fans/ sedimentation
IDENTIFIERS-- debris/ alluvial channels

R202512X67A ORIGIN OF THE PIEDMONT ANGLE

The piedmont angle, an abrupt rise in slope from plains to residual uplands, is an important geomorphic feature commonly observed in arid and semiarid lands. There is no general agreement on the evolution of the piedmont angle. Three hypotheses illustrating certain problems are reviewed, and field observations made in South Australia are presented. Some important aspects of the piedmont angle are: the piedmont angle is formed at the junction of consistently precipitous escarpments and flat plains, significant detrital accumulations rarely are present at the base of the hill slope, alluvial fans are poorly developed, and bedrock beneath the plains frequently is covered by a mantle of debris. The piedmont angle is principally of structural origin. The sharp break in slope is found at lithologic or structural boundaries but rarely is developed at fault zones. Any explanation of the piedmont angle must consider weathering and erosion of the bedrock. Resistant cappings and intense topographically controlled differential weathering and erosion, important in slope development, are not confined to desert regions. Although best and most generally developed in desert areas, pediments and the piedmont angle may develop in other climatic regions where structural conditions are favorable. Has 27 references.

R202512X67A

Twidale, C R
ORIGIN OF THE PIEDMONT ANGLE AS EVIDENCED IN SOUTH AUSTRALIA
Jour of Geol, Vol 75, No 4, pp 393-411, July 1967. U of Adelaide, Australia, 21 p, 10 fig, 2 plate, 27 ref
DESCRIPTORS-- *geology/ *geologic investigations/ geologic formations/ deserts/ *geomorphology/ slopes/ weathering/ erosion/ aggradation/ arid land/ semiarid land/ *topography/ *land forms/ alluvial deposits/ bedrocks/ bibliographies/ detritus
IDENTIFIERS-- pediments/ *piedmont/ structural geology/ Australia

R202522 66A ENGINEERING SEISMOLOGY

Although there is no known way of forecasting exact location, size, or time of an earthquake, a safe assumption for probabilistic predictions can be made on the basis that past patterns of seismic activity will continue. Estimation of the design earthquake and its effects are discussed. Site selection for a structure and prediction of site behavior during an earthquake are problems requiring the joint efforts of the engineer, geologist, and engineering seismologist. Techniques for developing data necessary to predict site behavior in an earthquake are explained; these techniques include borings, geology, seismographs, strong motion accelerographs, refraction seismographs, uphole seismic surveys, microtremor surveys, forced vibration studies, amplification spectra, ground motion spectra, and estimation of the design earthquake. The paper concludes with a section on industrial vibrations. Engineering seismologists assist in solving problems involving the hazards of natural and man-made ground motion by providing the basis for aseismic design, defining vibration movement, and recommending ways to reduce damages from these hazards. Has 37 references.

R202522 66A

Leeds, David J
ENGINEERING SEISMOLOGY IN SOUTHERN CALIFORNIA
Engineering Geology in Southern California, Assn of Engg Geologists, pp 35-53, Glendale, Calif, Oct 1966. Dames & Moore, Los Angeles, Calif, 19 p, 8 fig, 37 ref
DESCRIPTORS-- *seismology/ geophysics/ engineering geology/ seismic waves/ *seismic investigations/ seismic properties/ bibliographies/ seismographs/ vibrations/ earth movements/ *earthquakes/ *seismic design
IDENTIFIERS-- ground particle velocity/ earthquake-resistant struct/ site selection/ *earthquake engineering/ earthquake damage/ earthquake loads/ southern California

R202523 67A MICROTREMORS AND LANDSLIDES

Microtremor records show a close relationship between the shape of the period-distribution curve and characteristics of the subsoil. As the period-distribution curve is related to site characteristics, determining ground structure from the dominant period of microtremors should be possible; however, no adequate explanation is available based on wave theory. The quarter wavelength law, developed for explosion-generated surface waves, gives a relation of the dominant period to thickness of the ground layer and longitudinal wave velocity. As microtremors resemble surface waves, the author attempts to determine ground structure by applying the quarter wavelength law to the dominant period of microtremors. Field studies were conducted to determine suitability of the quarter wavelength law and to investigate ground structure in landslide areas. Results show the method permits determination of subsoil structure. The possibility of predicting landslide danger areas is also mentioned.

R202523 67A

Tamaki, I
THE DOMINANT PERIOD OF MICROTREMORS AND ITS APPLICATION TO THE INVESTIGATION OF LANDSLIDES. Proc, 3rd Asian Regional Conf on Soil Mech & Fdn Engg, Vol 1, Div 1-7, pp 353-357, Haifa, Israel, Sept 1967. Osaka Inst of Tech, Japan, 5 p, 8 fig, 1 tab, 7 ref
DESCRIPTORS-- vibrations/ *seismic investigations/ seismic waves/ subsoil/ seismic properties/ seismographs/ *subsurface investigations/ longitudinal waves/ *geophysics/ *engineering geology/ geologic investigations/ wave velocity/ bedrocks/ earthquakes/ seismology/ *landslides
IDENTIFIERS-- *microseisms/ slip planes/ slope stability/ structural geology

R202555 67A GEOPHYSICS AT STRAIGHT CREEK TUNNEL

Seismic and electrical resistivity measurements were made in the Straight Creek tunnel pilot bore during and immediately after construction. These measurements were interpreted to obtain seismic velocity and electrical resistivity of rock behind the disturbed rock surrounding the pilot bore. Velocity and electrical resistivity were found to have quite good correlation with time rate of construction, construction cost per foot, rock quality, set spacing, percentage lagging and blocking, type of steel support required, height of tension arch, and vertical load. Results indicate that predictions of engineering and economic parameters could be made for a new tunnel if correlations such as these could be established either during the initial stages of construction or from previous measurements of another similar tunnel constructed in similar rock. Additional seismic and resistivity surveys were made on the surface and in holes drilled from the surface over the line of the pilot bore. Reasonably accurate predictions are possible from surface measurements and would be useful for selecting a site if several alternative routes were under consideration. With an established predictive capability, tunneling efficiency can be improved and costly pilot bore construction probably could be eliminated.

R202555 67A

Scott, James H and Carroll, Roderick D
SURFACE AND UNDERGROUND GEOPHYSICAL STUDIES AT STRAIGHT CREEK TUNNEL SITE, COLORADO. Hwy Res Record, No 185, pp 20-35, 1967. USGS, Denver, Colo, 16 p, 10 fig, 3 tab, 8 ref
DESCRIPTORS-- *tunnel construction/ tunnel pressures/ tunneling/ *seismic investigations/ *geophysics/ engineering geology/ costs/ boreholes/ seismic waves/ *subsurface investigations/ reconnaissance surveys/ arch/ geologic investigations/ *electrical resistivity/ correlation techniques/ tunnels/ wave velocity
IDENTIFIERS-- rock properties/ tunnel supports/ electric logging/ *seismic refraction/ seismic velocity/ Straight Creek tunnel, Colo/ correlation

R202484X67A TURBULENT BOUNDARY LAYER

The author presents his impression of current knowledge on turbulent boundary layer flow. Prediction procedures are discussed, the most promising procedure is selected, and actions to be taken before the procedure will provide adequate predictions for the whole range of 2-dimensional flows are indicated. Boundary layer theories are classified as either explicit integral or effective viscosity theories. Explicit integral theories employ extensive empirical information on integral quantities such as drag coefficient and momentum thickness, and these explicitly express the auxiliary quantities appearing in differential equations. Effective viscosity theories are built upon partial differential equations and take their empirical input in the form of expressions for the effective viscosity. The effective viscosity approach is recommended as it offers a unified theory usable for all boundary layer phenomena. The Kolmogorov-Prandtl model appears to be the most promising of the various effective viscosity theories. Mathematical methods for solving partial differential equations are reviewed, and the author recommends marching integration procedures. Several outstanding problems are given, and the path for future research is discussed. Has 40 references.

R202484X67A

Spalding, D B
THEORIES OF THE TURBULENT BOUNDARY LAYER
Applied Mech Rev, Vol 20, No 8, pp 735-740, Aug 1967. U of London, G B, 6 p, 2 fig, 40 ref
DESCRIPTORS-- hydraulics/ fluid flow/ fluid mechanics/ digital computers/ *turbulent flow/ *boundary layer/ bibliographies/ mathematics/ integration/ mathematical analysis/ computation/ viscosity/ differential equations/ two-dimensional/ classifications/ reviews
IDENTIFIERS-- mathematical models/ foreign research/ Great Britain

R202509 67A TURBULENT FLOW IN SUDDEN ENLARGEMENTS

Methods defining the spread of turbulent flow discharging from hydraulic structures are described. The required area of protection against erosion is determined by calculating the location of the point of intersection of the spreading flow with the channel banks. Protection should extend to this point. The angle of spread is related to the Froude number of the flow and the relative width of the downstream channel (ratio of structure width to downstream channel width). Experimental data are compared with results of 2 theoretical investigations.

R202509 67A

Lilitskii, G A
SECTION OF FULL SPREAD OF TURBULENT FLOW WITH A SUDDEN ENLARGEMENT IN THE CHANNEL. Gidravlika i gidrotekhnika, No 3, pp 93-97, 1967. Transl from Russ, USBR Transl 722, Aug 1967, 9 p, 2 fig, 6 ref
DESCRIPTORS-- foreign design practices/ hydraulics/ Froude number/ *sudden enlargements/ open channels/ fluid flow/ model tests/ outflows/ *outlets/ calculations/ *energy dissipation/ eddies/ velocity/ small structures/ measurement/ scour/ erosion control/ *bank protection/ *turbulent flow/ hydraulic models/ *open channel flow
IDENTIFIERS-- USSR/ *flow patterns/ flow distribution/ flow characteristics

R202549 67A RADIOISOTOPES MEASURE PIPELINE DISCHARGE

Use of radioisotopes to measure waterflow is a part of the Bureau of Reclamation's program to improve water measurement practices. Measurements were made in the Salt River Project irrigation system in concrete pipelines 2, 2.5, and 3.5 ft in dia. A pitot velocity method was used to measure the discharge for comparison with the discharge measured by the sudden injection or total count radioisotope method. The sample tank and infinite medium techniques were used for counting the radioisotope activity. Accuracy of the radioisotope measurement method could not be evaluated extensively because of the limited number of tests. Although relatively good repeatability was shown in measuring a given discharge by the radioisotope method, discharges computed by the 2 methods differed by -7.3 to -15.7%.

R202549 67A

Schuster, Jack C
PIPELINE DISCHARGE MEASUREMENTS WITH RADIOISOTOPES
USBR Lab Rept Hyd-578, Hyd Br, Sept 1967. Bureau of Reclamation, Denver, Colo, 24 p, 8 fig, 5 tab, 1 ref
DESCRIPTORS-- *discharge measurement/ *radioactive isotopes/ tracers/ field tests/ mixing/ pipes/ *radiation measurement/ velocity/ geiger counters/ *test procedures/ pitot tubes/ concrete pipes/ pipelines/ injection/ water measurement
IDENTIFIERS-- mixing length/ irrigation water/ Salt River Project, Ariz/ scintillation counters/ *total count method/ gold isotopes/ accuracy/ sudden injection method

R202550 67A SURGE WAVE ATTENUATION BY A SIDE WEIR

Theoretical equations and supporting experimental data are presented for determining attenuation of surge waves by a longitudinal side weir in a trapezoidal channel. Comparisons are made of a theoretical equation derived previously for rectangular channels and an equation developed during the study; agreement of the equations with experimental data is determined. Surge heights were recorded by 6 capacitance-type wave probes with sensors consisting of plasticized-enamel-coated wire. Two short digital computer programs were developed for trial solutions of the theoretical equations. An explanation of each program, source statement listing, sample input data, and results are presented in an appendix.

R202550 67A

Rungrongtaanin, S and King, D L
ATTENUATION OF SURGE WAVES BY A SIDE WEIR IN A TRAPEZOIDAL CHANNEL
USBR Lab Rept Hyd-575, Hyd Br, Apr 1967. Bureau of Reclamation, Denver, Colo, 44 p, 14 fig, 5 tab, 13 ref, append
DESCRIPTORS-- canals/ model tests/ *surges/ *trapezoidal channels/ weirs/ hydraulic transients// bore /wave// Froude number/ translatory waves/ unsteady flow/ calibrations/ instrumentation/ measuring instruments/ recording systems/ capacitance/ dielectrics/ electronic equipment/ research and development/ oscillographs/ computer programming/ mathematical analysis/ hydraulic models/ hydraulics/ *open channel flow
IDENTIFIERS-- Citrini equation/ wave probes/ wave attenuation

R202533 67A FLOOD FORECASTING METHODS COMPARED

Knowledge of small basin floods and state-of-the-art of flood predictions on ungaged basins are such that engineering judgment still plays an important role in determining a design flood. An appraisal of the reliability of 5 current methods of flood prediction is presented. The first phase involved a comparison among flood estimates obtained by applying rainstorms estimated to have return periods of from 2 to 200 yr. For each of 6 such levels of protection applied to 14 real basins, inconsistencies among 5 methods produced differences in the magnitude of their estimates as great as 300%. Because long flood records for small basins were inadequate, observed rainfalls were applied to formulas and design methods for a second phase of the study. Design estimates based on recorded rainstorms were compared to 134 observed floods. These events occurred on 45 mixed-cover agricultural basins ranging in size from 0.12 to 8.16 sq mi, within 13 states of the U S. Scatter-diagrams, histograms, and statistics suggest some superiority of the Rational formula, Bureau of Public Roads method, and Tacitly Maximized Peak technique in that they generally overestimate floods from this study. Although their variability is also less than that of the other 2 methods, underprediction occurs in about one-third of the cases. Has 25 references.

R202533 67A

Hiemstra, Lourens A V and Reich, Brian M
ENGINEERING JUDGMENT AND SMALL AREA FLOOD PEAKS
Hydrology Paper 19, Colorado State U, Fort Collins, Apr 1967. 29 p, 11 fig, 9 tab, 25 ref, append
DESCRIPTORS-- *flood/ *flood forecasting/ *flood peaks/ river basins/ *design flood/ watersheds/ bibliographies/ rainfall/ probability/ small projects/ hydrologic data/ hydrology/ hydrographs/ rainfall intensity
IDENTIFIERS-- evaluation/ Rational formula/ comparative studies/ small watersheds

R202534 67A ACCURACY OF DISCHARGE DETERMINATIONS

The objective of this study was to analyze errors that may occur in discharge determinations made on mountain streams. Possible sources of error were considered and a classification of the sources, including notations on the nature of the resulting errors, was prepared. Methodology is given for evaluation of daily, monthly, and annual discharge estimates. An exhaustive literature review was undertaken regarding qualitative and quantitative aspects of the topic. The material was sorted in an attempt to divide the total error in a discharge determination into various component errors. Each component was analyzed to yield information about the random or systematic nature of the error and possible functional relationships; information is summarized in the form of a classification of errors. A hypothetical error model was developed for a single discharge measurement. Expected value and variance of the model were studied so that inferences could be made regarding the significant error terms. Consideration was given to the error arising from use of an estimated rating curve. A mathematical representation was given to the stage-discharge relationship and found to account for virtually all the variability in sample data for 9 mountain stream-gaging stations in Colorado. Lists 122 references.

R202534 67A

Dickinson, W T
ACCURACY OF DISCHARGE DETERMINATIONS
Hydrology Paper 20, Colorado State U, Fort Collins, June 1967. U of Guelph, Canada, 54 p, 11 fig, 17 tab, 122 ref
DESCRIPTORS-- *discharge measurement/ *streamflow/ stream gages/ pulsating flow/ mathematical analysis/ errors/ bibliographies/ hydrology/ correlation techniques/ current meters/ velocity/ discharge coefficients/ statistical analysis/ streams/ hydrometeorological station/ mountains/ velocity distribution
IDENTIFIERS-- *accuracy/ evaluation/ mathematical models/ stream gaging station/ streamflow simulator models

R202535 67A LINEAR ROUTING IN UNIFORM OPEN CHANNELS

A general linear solution to the flood routing problem is obtained by solving a linearized equation of motion for a semi-infinite uniform open channel subject to a delta-function inflow at the upstream end. This solution is used to compare the accuracy of the more important special linear procedures used in applied hydrology for flood routing. The effect of varying the reference discharge, used as the basis of the linearization, is examined.

R202535 67A

Dooge, J C I and Harley, B M
LINEAR ROUTING IN UNIFORM OPEN CHANNELS
Proc, Intl Hydrol Symp, Vol 1, pp 57-63, Fort Collins, Colo, Sept 1967.
University College, Cork, G B, 7 p, 4 fig, 7 ref
DESCRIPTORS-- *flood routing/ *open channels/ open channel flow/ hydrology/ outflows/ linear systems/ Froude number/ *hydrographs/ *flood hydrographs/ mathematical analysis/ discharges/ foreign design practices/ flood forecasting
IDENTIFIERS-- inflow/ Muskingum method/ Ireland

R202536 67A THRESHOLD FACTORS IN HYDROLOGIC SYSTEMS

Total water storage volume of a catchment can be visualized as being replaced by a uniform storage layer covering the whole catchment, with storage characteristics being an average of the catchment. For uniform precipitation conditions in this model catchment, threshold concepts approximately are valid. Rainfall relations being valid at all possible precipitation conditions which may be derived by way of new structured coaxial rainfall-runoff relations generally deviate from the model catchment relations. These deviations are a measure of the hydrological inhomogeneity of the considered natural catchments.

R202536 67A

Becker, Alfred
THRESHOLD CONSIDERATIONS AND THEIR GENERAL IMPORTANCE FOR HYDROLOGIC SYSTEMS INVESTIGATION. Proc, Intl Hydrol Symp, Vol 1, pp 94-102, Fort Collins, Colo, Sept 1967. Inst fur Wasserwirtschaft, Berlin, E Germany, 9 p, 4 fig, 2 ref
DESCRIPTORS-- hydrology/ reservoirs/ *water storage/ *runoff/ watersheds/ ground water/ *surface runoff/ *rainfall/ atmospheric precipitation/ soil moisture/ models/ groundwater recharge/ aquifers/ storms
IDENTIFIERS-- *catchments/ mathematical models/ East Germany

R202538 67A RELIABILITY OF RESERVOIR OPERATION

Probabilistic estimates of the reliability of storage reservoir operation may be made using 3 different bases for certainty: probability of a nonfailure year, duration time of all the nonfailure intervals, and quantity of water supplied to a consumer. For an unlimited period of time, certainty can be represented by a single value; however, for a finite time period there is a continuous distribution of certainty values. A method for determining the distribution of certainty values for any of the 3 types of certainty for a reservoir with seasonal input is presented. The method employs Moran's discrete approximation to a continuous distribution and Gould's method for determination of transition probabilities.

R202538 67A

Klemes, Vit
RELIABILITY ESTIMATES FOR A STORAGE RESERVOIR WITH SEASONAL INPUT
Proc, Intl Hydrol Symp, Vol 1, pp 414-421, Fort Collins, Colo, Sept 1967. Slovak Acad of Sci, Bratislava, Czechoslovakia, 8 p, 1 fig, 4 ref
DESCRIPTORS-- *probability/ *reservoir operation/ water management/ *water storage/ mathematical analysis/ distribution/ reservoirs/ reservoir yield/ hydrology/ project planning/ water yield/ *reliability/ storage
IDENTIFIERS-- *reservoir storage/ Czechoslovakia/ foreign research/ seasonal variations

R202539 67A FLOOD PEAK PREDICTION

Flood peak prediction methods are analyzed for performance in making estimates on small, ungaged, rural drainage basins. Five methods were used to predict individual floods on the basis of concurrently observed rainfall. Predictions made by the 5 methods are compared for 134 floods on 45 streams at 19 locations widely spaced across the U S. The methods were purposely tested in arid and nonarid regions and beyond the geologic zones for which they were developed in order to search for generality and adaptability. Scatter in predicted values is discussed in view of requirements and restrictions imposed by the developers of the various techniques. Diagrams and statistics illustrate the uncertainties involved and show which methods underpredict or overpredict this sample from nature.

R202539 67A

Reich, Brian M and Hiemstra, Lourens A V
PURPOSE AND PERFORMANCE OF PEAK PREDICTIONS
Proc, Intl Hydrol Symp, Vol 1, pp 565-572, Fort Collins, Colo, Sept 1967. Pennsylvania State U, University Park; Colorado State U, Fort Collins, 8 p, 5 fig, 2 tab, 8 ref
DESCRIPTORS-- flood/ *flood forecasting/ flood hydrographs/ *flood peaks/ hydrology/ drainage basins/ estimating/ statistics/ *design flood/ rainfall intensity/ design tools/ rainfall/ runoff/ hydrographs/ watersheds/ runoff coefficients
IDENTIFIERS-- *flood estimate

HYDROLOGY

R202558 67A LABORATORY STUDY OF WATERSHED HYDROLOGY

A conventional approach to study the rainfall-runoff relationship of a watershed uses historical hydrologic data to fit a black-box model for simulation of watershed hydrologic behavior. Although many measurements of rainfall input and runoff output from watersheds are available, no general theory explaining the course of flow mechanics from input to output exists. The proposed laboratory approach investigates basic laws and principles controlling mechanics of runoff from a watershed. It employs a watershed experimentation system (WES) as a tool for the research. The WES is an instrumentation system of integrated hydraulic, electronic, and structural design that can produce an artificial rainfall of variable time and space distribution to move over a laboratory area of 40 by 40 ft or less; thus, it is capable of simulating a storm moving in any direction over a testing drainage basin constructed within the area. The experiment is controlled electronically by a digital computer, and output runoff is measured by sonar detectors which transmit information to the computer for immediate recording and analysis. Various problems being studied include the time factor in runoff process, conceptual watershed roughness, and effect of storm movement on peak discharges. The WES also may be used to study subsurface runoff by employing testing basins made of porous materials.

R202558 67A

Chow, Ven Te
LABORATORY STUDY OF WATERSHED HYDROLOGY
Paper, Intl Hydrol Symp, Fort Collins, Colo, Sept 1967. U of Illinois, Urbana, 14 p, 3 fig, 7 ref
DESCRIPTORS-- *watersheds/ rainfall/ runoff/ hydraulic models/ hydrology/ hydrologic data/ storms/ simulation/ computer programming/ surface runoff/ models/ *drainage basins/ flow/ artificial precipitation/ laboratory equipment/ laboratory tests
IDENTIFIERS-- watershed experiment system/ rainfall simulators/ *rainfall-runoff relation/ raindrop splash/ urban hydrology/ black box analysis

IRRIGATION

R202529X67A SPRINKLER SYSTEM PROJECTS

A project-type sprinkler system comprises a central pressure-producing device and high-pressure mains radiating to farm delivery locations. The minimum cost distribution system will deliver just enough water to meet peak demands with sprinklers operating almost continuously. An equation is developed to determine cost differential between this minimum capacity system and one using large pipe to allow part-time sprinkling. A method for economic sizing of pipe in a gravity system is developed and its use illustrated; an economic sizing method for pump discharge lines with lateral turnouts is developed also. Use of graduated-size pumps is recommended to provide greatest flexibility in operation with a reasonable number of units. Fluctuation of operating pressures at farm delivery, caused by changing demand during the irrigation season, remains a problem in the use of these systems.

R202529X67A

Mandry, James E
DESIGN OF PIPE DISTRIBUTION SYSTEMS FOR SPRINKLER PROJECTS
ASCE Proc, Jour Irrig & Drng, Vol 93, No IR3, Paper 5454, pp 243-257, Sept 1967. Bureau of Reclamation, Denver, Colo, 15 p, 6 fig, 2 tab, 3 ref, append
DESCRIPTORS-- *sprinkler irrigation/ projects/ irrigation systems/ design/ pipelines/ automatic control/ *distribution systems/ pumping plants/ costs/ hydraulic gates and valves/ optimum design/ hydraulic gradients/ sizes/ water hammer/ fluid friction/ economics
IDENTIFIERS-- formulas/ layout/ pressure control mechanism/ discharge lines

R202537 67A ESTIMATING IRRIGATION WATER REQUIREMENTS

IRRIGATION

The Bureau of Reclamation currently is studying better procedures for estimating various factors comprising the total irrigation water requirement: crop consumptive use, effective precipitation, distribution losses, surface runoff, and deep percolation. Preliminary data show that the most common cause of lower-than-optimum irrigation efficiency is lack of sufficient information on the part of the irrigator about the optimum time to apply water and the quantity to be used. To illustrate the importance of farm efficiencies on the project water requirement, a change from 50 to 60% farm irrigation efficiency on a project would result in a 17% reduction in water requirement for the area or a 20% increase in the area which could be served, assuming the reservoir and conveyance efficiencies remained constant. This example represents the extreme case, since it does not take into account any downstream reuse of return flow; nevertheless, it points out that improved efficiency of the use of present water supplies in some areas may be more attractive in terms of both costs and benefits than the development of new supplies. Relative importance of the various factors is discussed and revised procedures for estimating them are presented.

R202537 67A

Robb, David C N
PROCEDURES FOR ESTIMATING IRRIGATION WATER REQUIREMENTS
Proc, Intl Hydrol Symp, Vol 1, pp 141-148, Fort Collins, Colo, Sept 1967. Bureau of Reclamation, Denver, Colo, 8 p, 2 fig, 1 tab, 4 ref, append
DESCRIPTORS-- irrigation/ *water requirements/ forecasting/ percolation// consumptive use /water// evapotranspiration/ surface runoff/ estimating/ *irrigation efficiencies/ seepage losses/ irrigation practices/ benefits// demand /irrigation systems// distribution systems/ costs/ irrigation O&M/ agriculture
IDENTIFIERS-- Bureau of Reclamation/ water use

R202548X67A COMPUTER CONTROLLED AUTOMATIC TESTING

MATHEMATICS

The digital computer has assumed a very active and powerful role in controlling automatic test equipment. It has become a vital component of the test system because of its inherent abilities for high-speed calculation, large-capacity memory, and programmed decision making--abilities that enable the test system to isolate faults to a level normally attainable only by skilled test personnel. The computer provides the test designer with a flexibility that eases the planning of test procedures and reduces the size of the total test program. It readily accommodates mathematical diagnostic techniques as they are perfected and opens the door to simplifications in the stimulus and measurement equipment that it controls. The philosophy of computer-controlled automatic testing is reviewed, and specific cases of the powerful role played by the computer are presented.

R202548X67A

Joyce, B T and Stockton, E M
COMPUTER CONTROLLED AUTOMATIC TESTING
Software Age, Vol 1, No 1, pp 18-26, Sept 1967. Radio Corp of America, Burlington, Mass, 6 p, 9 fig, 2 ref
DESCRIPTORS-- *automatic control/ *control systems/ *test procedures/ data processing systems/ computer programming/ digital computers/ measurement/ analog computers/ digital-to-analog converter/ digital systems/ operations research/ mathematical analysis/ laboratory tests/ technology/ logic/ reviews/ measuring instruments/ scientific method
IDENTIFIERS-- testing equipment/ application techniques/ diagnostic routines

MATERIALS ENGINEERING

R202502X67A CORROSION IN STEEL WATER MAINS

If an adequate corrosion control system for a steel water main is to be designed and installed at minimum expense, the corrosion engineer should be authorized to conduct a complete corrosion survey prior to the start of construction so that the most favorable corrosion control design can be incorporated into the system as it is constructed. To prevent external galvanic corrosion, a combination of coating and cathodic protection has gained wide acceptance as the best solution. When internal protection is needed because chemical analysis shows the water to be aggressive to steel, corrosion usually can be controlled by applying an internal coating system using a cement lining or standard coal-tar enamel coating. One hundred percent corrosion control can be achieved by providing internal cathodic protection using a zinc strip anode. Principles of corrosion and various methods of control are described.

R202502X67A

Peabody, A W
CORROSION IN STEEL WATER MAINS
AWWA Jour, Vol 59, No 8, pp 993-1002, Aug 1967. Ebasco Services, Inc, N Y, N Y, 10 p, 11 fig
DESCRIPTORS-- *corrosion/ *steel pipes/ *water pipes/ *corrosion control/ pipelines/ *cathodic protection/ electrical conductance/ electric currents/ electric insulation/ fittings/ anodes/ cathodes/ railroads/ electrical grounding/ tramways/ electrolysis/ protective coatings/ cinders/ costs
IDENTIFIERS-- galvanic corrosion/ electrochemical corrosion/ stray current corrosion/ rectifier ground-bed method/ *corrosion currents/ galvanic protection systems/ underground corrosion/ buried metalwork/ insulation// surveys /data collection/

MECHANICAL ENGINEERING

R202532 67A USSR FRANCIS TURBINE MODEL TESTS

Investigating models of Francis turbine runners in a USSR hydraulic machine laboratory showed the causes for formation of vortical turbulence behind the runner, leading to increased cavitation and vibration of the unit. Five models of runners having a constant draft tube height with a greater-than-critical cavitation coefficient were compared by visual observation, velocity measurements, linear measurements of vortical flow diameter parallel to and 100 mm from the lower plane of the band, and ratio of the diameter of vortical disturbance to the diameter of the draft tube entrance. Results of flow torsion measurements at the runner exit were compared with calculated data obtained by computing the effect of the distributor. Conclusions were: (1) Vortical turbulence behind the runner is caused by flow torsion at the runner outlet. (2) During runner design calculations, flow torsion at the runner exit should be considered, taking into account the unevenness of flow torsion created by the distributor. (3) For Francis turbines with a specific speed of 200, flow torsion can be defined satisfactorily and meridional projection of the blades chosen so that hub velocity equals zero or is slightly negative.

R202532 67A

Kliuikov, N T
SOME RESULTS OF MODEL TESTS ON FRANCIS HYDRAULIC TURBINES
Energomashinostroenie, No 4, pp 35-37, 1963. Transl from Russ, USBR Transl 708, Aug 1967, 16 p, 5 fig, 1 tab, 5 ref, append
DESCRIPTORS-- *Francis turbines/ *model tests/ turbine parts/ *vortices/ turbine runners/ turbine blades/ foreign design practices/ draft tubes/ velocity distribution/ *turbulence/ fluid flow/ fluid mechanics/ guide vanes/ *cavitation/ efficiencies/ torsion/ *hydraulic machinery/ vibrations/ hydraulic turbines
IDENTIFIERS-- USSR/ foreign research/ machine design/ optimum performance/ comparative studies

R202545 67A HYDRAULIC RESONANCE--POWERPLANT CONDUITS

Field tests of hydraulic resonance in pressure conduits for hydroelectric powerplants in the USSR pointed to the need for further field and laboratory investigations. Powerplants with operating Francis, Kaplan, and twin-blade Kaplan turbines were examined for: (1) vibrations behind the runner, causing pressure surges in draft tubes or penstocks and (2) frequency, harmonics, and amplitudes of the vibrations leading to hydraulic resonance. Francis turbines were tested at partial loads and heads with 30 to 85% distributor openings. Kaplan turbines were tested during various operating conditions, including motoring. These tests showed that during turbine operation, hydraulic resonance may occur at frequencies of 0.3 to 200 hz, inducing intense pressure surges and vibrations in the unit and pressure conduits and thus reducing service life of and sometimes causing damage to the equipment. Hydraulic resonance frequency is determined by pressure conduit parameters and nature of the flow disturbance. During design, a check computation should be made using design dimensions that preclude resonance at frequencies occurring during turbine operation. Resonance in the throat ring is particularly dangerous because of the interaction with the mechanical resonance of the blades at one of their natural frequencies.

R202545 67A

Shramkov, K A
HYDRAULIC RESONANCE IN THE CONDUITS OF HYDROELECTRIC POWERPLANTS
Gidrotek Stroitel'stvo, No 2, pp 12-16, 1967. Transl from Russ, USBR Transl 689, Aug 1967, 23 p, 11 fig, 2 tab, 3 ref, append
DESCRIPTORS-- *penstocks/ *draft tubes/ hydroelectric powerplants/ *surges/ hydraulics/ hydraulic structures/ *resonance/ pressure pipes/ water hammer/ *pressure conduits/ vibrations/ hydraulic turbines/ frequency modulation/ turbine runners/ turbine blades/ frequency/ frequency shifts/ damages/ natural frequency
IDENTIFIERS-- USSR/ sinusoidal/ harmonics/ *hydraulic resonance

R202557 67A CONTINENTAL HYDROLOGIC DROUGHTS

Concepts for objective definition of hydrologic droughts are proposed and elective factors for such definition presented. These include: the phenomenon determining the drought, variables describing this phenomenon, moisture level at which a drought starts, and the area related to the drought. Three runs as statistical properties of time and space distribution of moisture are proposed to represent parameters of drought definition: (1) run-length of negative deviations (duration of drought), (2) run-sum of negative deviations between a downcross and an upcross (severity of a drought), and (3) area-run as the deficit of all moisture over a time duration (run-length) and an area of drought. Examples of these methods used to determine properties of runs are the independent standard normal and log-normal variables. Results obtained at Colorado State University in the last 4 to 5 yr on properties of precipitation, effective precipitation, and runoff affecting the description of droughts and explaining the outlook for drought prediction are reviewed. Possibilities of drought prediction and potential causal factors explaining droughts are discussed. An approach is proposed for prediction of large continental droughts by an interrelationship of oceanic synoptic situation and continental precipitation.

R202557 67A

Yevjevich, Vujica
AN OBJECTIVE APPROACH TO DEFINITIONS AND INVESTIGATIONS OF CONTINENTAL HYDROLOGIC DROUGHTS. Hydrology Paper 23, Colorado State U, Fort Collins, Aug 1967. 19 p, 9 fig, 1 tab, 12 ref
DESCRIPTORS-- *droughts/ hydrology/ atmospheric precipitation/ rainfall/ runoff/ surface runoff/ streamflow/ streamflow records/ investigations/ *climatology/ *forecasting/ weather/ statistical analysis/ *meteorology/ weather modification
IDENTIFIERS-- water transfer/ Monte Carlo method/ histograms/ insurance

R202491X67A HYDROELECTRIC RESOURCES IN BRAZIL

A survey of the hydroelectric resources in the State of Minas Gerais, Brazil, is described. An investigation was made to inventory all feasible powersites on the rivers of the 6 major basins, covering 90% of the State. The survey included 670,000 sq km of drainage area and 17,000 km of watercourse. 280 hydroelectric sites were field examined; 150 were found to qualify for inclusion in this inventory and represented a total potential of approximately 15,000 mw. Feasibility studies of 11 of the better sites suggest a total capability of over 5,600 mw. The purpose of this survey was to select good projects for inclusion in a long-range program of orderly development. Inadequacy of existing hydrometric records established a need for a suitable network of hydrometric stations to collect water data. Details of this hydro survey and methods used to obtain reasonable accuracy at minimum expense are discussed. The survey was principally concerned with hydropower but also covered irrigation, navigation, and flood control.

R202491X67A

Anonymous
THE HYDROELECTRIC RESOURCES OF MINAS GERAIS--BRAZIL
Water Pwr, Vol 19, No 7, pp 269-282, July 1967. Tech Staff of Centrais Electricas de Minas, Gerais, Brazil, 9 p, 6 fig, 2 tab
DESCRIPTORS-- project planning/ project feasibility/ foreign projects/ water resources/ streamflow records/ *hydroelectric power/ reconnaissance surveys/ hydrometeorological station/ geology/ *river basin development/ multiple purpose projects/ hydrology/ *feasibility studies/ water storage
IDENTIFIERS-- Brazil/ *hydroelectric power surveys/ economic growth/ site selection/ *hydroelectric resources

R202492X67A PLANNING OF PUMPED STORAGE PLANTS

Location and size of a pumped storage plant are determined by natural conditions, distance from the consumption center and main source of pumping energy, and specific conditions in the supply area. Basic considerations regarding the design of pumped storage plants are reviewed and discussed. They include: (1) Fundamental factors determining choice of plant location and size; (2) economic, geologic, and operational factors determining general arrangement; (3) choice of underground, partially underground, or surface-type powerhouses and penstocks; (4) location of upper reservoir, type of intake structure, and selection of penstock or pressure shaft; (5) powerhouse design (especially underground plants), depending on location of penstock valves and transformers; (6) comparison of horizontal and vertical units, or use of reversible pump turbine units; (7) design considerations of underground plants, tailwater gates, tailwater tunnels, and outlet structures; and (8) importance of the lower reservoir location and water level to the overall project. Costs of pumped storage projects are discussed, and a tabulation of statistical data for 15 pumped storage plants is included.

R202492X67A

Blind, Hans
PLANNING OF PUMPED-STORAGE PLANTS
Water Pwr, Vol 19, No 6-7, pp 226-230 & 287-292, June & July 1967. Lahmeyer-Intl, Frankfurt, W Germany, 11 p, 19 fig, 4 tab
DESCRIPTORS-- project planning/ *pumped storage/ hydroelectric powerplants/ economics/ pump turbines/ geology/ reservoirs/ *underground powerplants/ costs/ surge tanks/ penstocks/ intake structures/ hydraulic machinery/ foreign design practices/ pumps/ turbines/ backwater/ hydraulics/ outlet works/ tunnels
IDENTIFIERS-- *site selection/ West Germany/ rock properties

R202517X67A CABLE METHOD OF IN SITU ROCK TESTING

ROCK MECHANICS

When applying a load to massive rock in situ, obtaining a suitable reaction point is difficult. The problem usually is overcome by confining such tests to tunnels or slits in rock. An alternative method is to anchor cables in a borehole; further advantages are derived if 2 parallel cables are used. By this method, large forces can be applied to the rock surface directly and in any desired direction. With 2 cables, the volume of rock influenced becomes greater, and an additional jacking load parallel to the rock surface can be applied between the heads. Thus, anisotropy of rock properties can be detected, and the shear strength can be found by carrying the test to failure. The analysis, based on the Boussinesq and Cerrutti solutions, is extended to cover the case of transverse isotropy. A description of pilot field trials is included. Has 57 references.

R202517X67A

Zienkiewicz, O C and Stagg, K G
CABLE METHOD OF IN SITU ROCK TESTING
Intl Jour of Rock Mech & Min Sci, Vol 4, No 3, pp 273-300, July 1967. U of Swansea, G B, 28 p, 22 fig, 2 tab, 57 ref, append
DESCRIPTORS-- *rock mechanics/ boreholes/ *deformation/ field tests/ loads/ bibliographies/ foundation investigations/ anchors/ displacements/ tension/ elasticity modulus/ cables/ shear strength/ *test procedures/ tensile stress
IDENTIFIERS-- *in situ tests/ *jacking tests/ rock properties/ Boussinesq equation/ plate load tests/ Great Britain/ foreign testing

R202487 67A EARTH PRESSURE CHARTS FOR RETAINING WALLS

SOILS ENGINEERING

The development of a set of curves for computing active earth pressures of cohesionless soils against retaining walls is described. The curves are based on Coulomb's theory and show the relation between active earth pressure and the angle of internal friction, angle of wall face to the vertical, angle of embankment slope to the horizontal, and angle of wall friction. This paper is concerned solely with the problem of soil masses moving downward, relative to the wall for which the wall friction angle is positive. The designer can determine quickly the active earth pressures for a selected combination of variables; the charts give the designer a wide range of values for each variable and readily lend themselves to interpolation. When used with a full understanding of the assumptions and limitations of the Coulomb theory, the design charts offer a means of quickly and accurately calculating earth pressure against retaining walls. The report contains 33 design charts.

R202487 67A

Benson, Fred C
DESIGN CHARTS FOR COEFFICIENTS OF ACTIVE EARTH PRESSURE OF COHESIONLESS SOILS--A RAPID METHOD. Hwy Res Record, No 181, pp 55-76, 1967. Humble Oil & Refin Co, New Orleans, La, 22 p, 34 fig, 3 ref, append
DESCRIPTORS-- *retaining walls/ *design tools/ *noncohesive soils/ *active pressures/ soil mechanics/ soil pressures/ internal friction/ graphical analysis/ *earth pressures/ charts/ curves/ wall friction
IDENTIFIERS-- Coulomb failure theory/ slope angles

R202488 67A STRESS DISTRIBUTION IN LONG EMBANKMENTS

The distribution of stresses within and under embankments because of embankment weight is of interest to engineers in a variety of applications. Consideration of deformation within embankments, analysis of stability, and consolidation of underlying compressible materials all require determination of the distribution of these stresses. The magnitude and distribution of stress in the foundation material in the vicinity of the embankment were found to be significantly different from those predicted by the usual assumption of stress proportional to embankment height applied to the foundation. Influence charts for a variety of embankment shapes are given. Has 27 references.

R202488 67A

Perloff, W H; Baladi, G Y; Harr, M E
STRESS DISTRIBUTION WITHIN AND UNDER LONG ELASTIC EMBANKMENTS
Hwy Res Record, No 181, pp 12-40, 1967. Purdue U, Lafayette, Ind, 29 p, 28 fig, 27 ref, 2 append
DESCRIPTORS-- *embankments/ *stress distribution/ stress analysis/ stress/ elasticity/ weight/ bibliographies/ homogeneity/ shear stress/ shear/ soil mechanics/ stability analysis/ Poisson ratio/ consolidation/ deformation
IDENTIFIERS-- height/ length

R202513X67A PROGRESSIVE FAILURE IN SLOPES

All evidence indicates that slides in slopes of overconsolidated clays and clay shales are preceded by the development of a continuous sliding surface caused by progressive failure. Requisite conditions for progressive failure are discussed, and the author suggests that progressive failure may result from a large amount of recoverable strain energy in the clay. In clays with weak diagenetic bonds, strain energy is recovered immediately upon a reduction in load. In clay shales, diagenetic bonds are formed when the clay carries its maximum consolidation pressures, thereby locking in recoverable strain energy and releasing it only when the bonds are destroyed gradually by weathering near the surface. Examples of slope failure disasters are cited. Has 61 references.

R202513X67A

Bjerrum, Laurits
PROGRESSIVE FAILURE IN SLOPES OF OVERCONSOLIDATED PLASTIC CLAY AND CLAY SHALES--THE THIRD TERZAGHI LECTURE. ASCE Proc, Jour Soil Mech & Fdns, Vol 93, No SM5, Paper 5456, pp 1-49, Sept 1967, Part 1. Norwegian Geotech Inst, Oslo, 47 p, 21 fig, 3 tab, 61 ref, append
DESCRIPTORS-- *failure /mechanics// *slopes/ *clays/ plasticity/ disasters/ *overconsolidation/ *clay shales/ *landslides/ bibliographies/ weathering/ soil mechanics/ *sliding/ creep/ shear stress/ shear strain
IDENTIFIERS-- *Terzaghi Lecture/ *slope stability/ strain energy/ Bearpaw shale/ *progressive failures/ diagenetic bonds/ high plasticity soils

R202524 67A SOIL PRESSURES AROUND BURIED PIPES

Distribution of pressure around a buried pipe is analyzed and discussed. The author suggests that present methods of pipeline and culvert design dangerously underestimate the pressure involved. In the initial period of the life of the pipeline, pressures on the sides can reach values approaching the passive level; pressures over the crown will be higher than those caused by simple overburden. As time progresses, lateral pressures are reduced to values commensurate with the earth pressure in the at-rest condition, while vertical pressures tend toward the simple overburden level. Various theories of estimating soil pressure are discussed.

R202524 67A

Mackey, R D
SOIL PRESSURES AROUND BURIED PIPES
Proc, 3rd Asian Regional Conf on Soil Mech & Fdn Engg, Vol 1, Div 1-7, pp 338-341, Haifa, Israel, Sept 1967. SEATO Grad Schl of Engg, Bangkok, Thailand, 4 p, 6 fig, 6 ref
DESCRIPTORS-- *soil pressures/ *pipes/ concrete pipes/ *pipelines/ ditches/ *pressure distribution/ backfills/ bedding materials/ trenches/ underground structures/ culverts/ lateral forces/ compaction/ soil compaction
IDENTIFIERS-- *buried pipes/ pipe bedding/ Marston formula/ pipe cradles/ Spangler formula/ pipe cover/ rigid pipes

R202546 66A LOESS COMPACTION BY FLOODING & EXPLOSIONS

The usual method of compacting slumping loess soils by flooding is hampered or impossible in built-up areas where nearby structures on unflooded soils can be affected. A proposed method makes selective compaction possible in a shorter time with appreciably less damage to surrounding soils. Narrow vertical trenches forming settling joints are excavated to eliminate the binding forces between the flooded and unflooded sections. Drain wells are driven into the zone to be compacted and the soil is flooded. After the water content of the soil exceeds the liquid limit, deep explosions are set off in the soil, causing intense compaction. Underground cavities are not formed at the explosion sites. The usual method and the new proposed method for compacting loess soils were compared by full-scale tests at 2 sites at Zaporozhe, USSR. The experiments confirmed the effectiveness of the new method.

R202546 66A

Litvinov, I M
ACCELERATED METHOD OF DEEP COMPACTION OF SLUMPING LOESS SOILS OF THE II TYPE BY PRELIMINARY FLOODING AND DIRECTED EXPLOSIONS. Soil Mech & Fdn Engg, No 2, pp 116-121, Mar-Apr 1966. 6 p, 4 fig, 1 tab, 2 ref
DESCRIPTORS-- *loess/ *soil compaction/ *soil consolidation tests/ ponding tests/ puddling/ wells/ explosions/ blasts/ settlement/ soil mechanics/ foreign construction/ liquid limits/ trenches/ soil investigations/ *soil stabilization/ underground explosions/ compaction
IDENTIFIERS-- subsidence/ flooding/ USSR/ soil engineering

R202551X67A FORCES ON RIGID CULVERTS UNDER HIGH FILLS

Forces acting on the barrel of a rigid culvert, caused by the dead load of a high fill, may depend on the construction method, presence of organic material, material of the earth's crust, fill properties, and culvert geometries. These features are accounted for by the finite-element method for obtaining approximate solutions to plane problems of linear elasticity. Analytical methods were applied to an actual embankment over a rigid culvert whose barrel was instrumented with pressure meters; analytical results for 2 conditions of the earth's crust, various fill properties, and a hay block placed over the crown of the culvert are compared with recorded pressures. The conclusion was that given a proper description of the material properties, in particular the fill-to-hay modular ratio, an accurate distribution of barrel pressure may be obtained.

R202551X67A

Brown, Colin B
FORCES ON RIGID CULVERTS UNDER HIGH FILLS
ASCE Proc, Jour of Struc, Vol 93, No ST5, Paper 5501, pp 195-215, Oct 1967. Columbia U, N Y, N Y, 21 p, 14 fig, 1 tab, 12 ref, append
DESCRIPTORS-- *culverts/ *embankments/ load distribution/ instrumentation/ elasticity/ pressure sensors/ computer programming/ deformation/ *fills/ *dead loads/ external forces/ pipes/ deterioration/ *loads/ backfills/ *earth pressures
IDENTIFIERS-- *rigid pipes/ finite element method/ arching/ hay/ San Luis Dam, Calif/ organic matter/ analytical method

R202554 67A SOIL ARCH ANALYSIS OF BURIED STRUCTURES

Laboratory observations on buried structures conclude that the Marston theory cannot be used indiscriminately for loads on underground pipe. To allow for pressure redistribution across the top of a buried flat-roofed structure, a different differential element must be assumed. A circular arch-shaped element was chosen for this study, after which location of its soil arch support had to be determined. There is no justification for assuming that the arch extends only across the prism of soil directly above the buried structure. From the theory of elasticity, location of the soil arch support was assumed to be at the location of maximum shear stress within the soil mass. If movement or strain should occur in the soil, the major part should take place in the region of maximum shear stress. Theory of elasticity is used only to locate the region of maximum shear stress before any soil grain slippage occurs. The author proposes that a movement or strain within the soil mass will cause the differential arch to form. A differential equation was written using the circular arch. When all parameters were included, the resulting equation was not readily integrable; therefore, a numerical integration procedure was used. Results are compared with model studies and field installations where adequate information was available. Has 15 references.

R202554 67A

Nielson, F Dwayne
SOIL STRUCTURE ARCHING ANALYSIS OF BURIED FLEXIBLE STRUCTURES
Hwy Res Record, No 185, pp 36-50, 1967. New Mexico State U, University Park, 15 p, 14 fig, 15 ref
DESCRIPTORS-- soil mechanics/ soil pressures/ *stress distribution/ stress analysis/ elastic theory/ *underground structures/ analysis/ laboratory tests/ models/ *earth pressures/ *conduits/ shear stress/ field tests/ elasticity modulus/ differential equations/ loads/ deflection/ stress/ *culverts/ earth movements/ soil investigations/ pressure distribution/ fills/ bibliographies/ buried membranes
IDENTIFIERS-- Marston formula/ *soil arch/ *buried pipes/ *flexible pipes/ *buried structures/ arching/ *flexible structures

R202495 67A COOLING SPIRAL CASES DURING EMBEDMENT

Movement or deformation of turbine components is unrelated to the circulation of cooling water through the spiral case during concrete embedment. This was shown by measurements taken during construction of the San Luis Pumping-Generating Plant. The installation of 8 units afforded an opportunity to study the effects of varying amounts of cooling water circulation. Concrete temperature increases resulting from heat of hydration of the cement were recorded, as were deformations to head cover seats and lower stationary wearing rings. No correlation could be distinguished between increased temperatures in the concrete and measured pump-turbine component deformations.

R202495 67A

McKay, R G
AN INVESTIGATION OF THE VALUE OF CIRCULATING COOLING WATER THROUGH SPIRAL CASES DURING CONCRETE EMBEDMENT--SAN LUIS PUMPING-GENERATING PLANT. USBR Rept SA-8, Struc & Arch Br, June 1967. Bureau of Reclamation, Denver, Colo, 22 p, 10 fig, 3 tab
DESCRIPTORS-- cooling water/ circulation/ temperature control/ turbine parts/ thermocouples/ *spiral cases/ *pump turbines/ heat of hydration/ hydroelectric powerplants/ measuring instruments/ thermal expansion/ field tests/ deformation/ instrumentation/ correlation techniques/ *installation/ *structural analysis/ pumped storage
IDENTIFIERS-- San Luis Pumping-Generating/ *temperature rise/ California/ embedded instruments/ wearing rings

R202547 66A PRECAST COMPOSITE CONCRETE FOUNDATIONS

A more accurate determination of the contact pressures between layers of precast composite reinforced concrete foundations is developed. Contact pressures are determined from an examination of elastic deformations of the layers caused by soil-reaction pressure. Possibility of contact pressure redistribution as a result of the formation of plastic hinges is taken into account in the limiting state. The prerequisite of a linear character of contact pressure distribution between the layers is excluded from the calculation of the foundation. The foundation is calculated independently with respect to length and width, on the assumption of plane bending in each of these directions. Experimental investigations have shown that when a foundation bends, cohesive forces between layers are overcome over the entire length of contact; consequently, only unilateral constraints (compressive normal forces and friction forces caused by them) are possible. This circumstance complicates the selection of the calculation scheme and calculation of the foundation itself, since systems with unilateral constraints are not linearly deformable. Three different analyses of foundations, depending on size ratio of the layers, are discussed and recommendations for design are given.

R202547 66A

Rivkin, S A
CALCULATION OF PRECAST COMPOSITE REINFORCED-CONCRETE FOUNDATIONS UNDER COLUMNS IN TERMS OF STRENGTH AND CRACKING. Soil Mech and Fdn Engg, No 1, pp 25-35, Jan-Feb 1966. 11 p, 6 fig, 2 ref
DESCRIPTORS-- *foundations/ *precast concrete/ *footings/ compressive strength/ cracking/ elastic deformation/ pressure distribution/ buildings/ friction/ structural engineering/ columns/ foreign design practices/ reinforced concrete
IDENTIFIERS-- friction coefficient /mech// USSR

R202516X67A WATER POLLUTION CONTROL REQUIRES ACCURACY

Effective water pollution control is dependent on the acquisition of objective and accurate scientific data on existing water quality. These data must identify specific pollutants, define their concentrations, and describe their effects on present and potential water uses. Such information is essential to the assessment of conditions and the planning and attainment of abatement and for legal action to secure compliance with water quality standards. The role of analytical chemistry in water pollution control is discussed, and the analyst must consider the past history of the sample and desired uses for the water and choose those tests pertinent to water use application. Chemical analysis of water and waste samples can be divided into 2 general classes: specific pollutants present and water quality characteristics. In addition to being a complex mixture, a water sample is a dynamic system undergoing constant change from the time the sample is taken. Analytical sensitivity, precision and accuracy of the analysis, methods, field laboratories, legal aspects, data handling, automated instrument analysis, monitoring techniques, and research needs relevant to water pollution control are studied.

R202516X67A

Ballinger, Dwight G
EFFECTIVE WATER POLLUTION CONTROL REQUIRES ACCURATE DATA
Environ Sci & Technol, Vol 1, No 8, pp 612-616, Aug 1967. FWPCA, Cincinnati, Ohio, 5 p, 1 fig, 1 photo, 4 tab
DESCRIPTORS-- *water pollution/ *pollution abatement/ waste disposal/ pH/ *water quality/ chemical analysis/ wastes/ organic compounds/ automation/ oxygen content/ microorganisms/ sewage effluents/ analysis/ acids/ field tests/ instrumentation/ laboratory tests/ chemical engineering/ data storage systems/ data collection systems/ data processing systems/ water analysis
IDENTIFIERS-- alkalinity/ *water pollution control

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